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POLLUTION OF THE NAVIGABLE WATERS OF DADE COUNTY, FLORIDA, AND TRIBUTARIES, EMBAYMENTS AND COASTAL WATERS. PROCEEDINGS OF CONFERENCE HELD AT MIAMI, FLORIDA ON OCTOBER 20-22, 1970

Federal Water Quality Administration
Washington, D. C.

1970

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CONFERENCE

IN THE MATTER OF

POLLUTION OF THE NAVIGABLE WATERS OF DADE COUNTY, FLORIDA, AND TRIBUTARIES, EMBAYMENTS AND COASTAL WATERS

held at

Sheraton Four Ambassadors Hotel
Pan American Room
Miami, Florida

October 20-22, 1970

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A conference in the matter of pollution of the navigable waters of Dade County, Florida, and tributaries, embayments and coastal waters convened at 9:30 o'clock on October 20, 1970, in the Pan American Room, Sheraton Four Ambassadors Hotel, Miami, Florida.

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PROCEEDINGS

OPENING STATEMENT
BY
MR. MURRAY STEIN

MR. STEIN: The conference is open.

This conference in the matter of pollution of the navigable waters of Dade County, Florida, and tributaries, embayments, and coastal waters is being held under the provisions of Section 10 of the Federal Water Pollution Control Act.

Under the provisions of the Act, the Secretary of the Interior is authorized to call a conference of this type when requested to do so by the Governor of a State. In a letter dated July 21, 1970, to the Honorable Walter J. Hickel, Secretary of the Interior, Governor Claude R. Kirk, Jr., of Florida, requested that a conference be called to consider pollution of the navigable waters of Dade County, Florida. On the basis of this request, the Secretary of the Interior, on September 25, 1970, sent a notice of conference to the official State water pollution control agency, which is the Florida Department of Air and Water Pollution Control.

Both the State and Federal Governments have responsibilities in dealing with water pollution control problems. The

Federal Water Pollution Control Act declares that the States have primary rights and responsibilities for taking action to abate and control pollution. Consistent with this, we are charged by law to encourage the States in these activities.

At the same time, the Secretary of the Interior is charged by law with specific responsibilities in the field of water pollution control. The Federal Water Pollution Control Act provides that pollution of interstate or navigable waters which endangers the health or welfare of any persons shall be subject to abatement. This applies whether the matter causing or contributing to the pollution is discharged directly into such waters or reaches such waters after discharge into a tributary.

The purpose of the conference is to bring together the State water pollution control agency, representatives of the United States Department of the Interior, and other interested parties to review the existing situation, the progress which has been made, to lay a basis for future action by all parties concerned, and to give the State, localities, and industries an opportunity to take any indicated remedial action under State and local law.

The Florida Department of Air and Water Pollution Control will be represented by Mr. Nathaniel Reed and his colleagues.

Mr. Reed, do you and your group want to introduce yourselves?

MR. REED: Directly on my left is Mr. Vincent Patton, Director of the department.

On his left is Dr. James Bax, Secretary of Health and Rehabilitative Services.

On his left is the local Pollution Control Officer for Dade County, Mr. Peter Baljet.

MR. STEIN: The Federal conferee is Mr. John Thoman, on my right, who is the Regional Director for the Southeastern Region of the Federal Water Quality Administration, with headquarters in Atlanta.

My name is Murray Stein and I am from headquarters of the Department of the Interior in Washington, D. C., and the representative of Secretary Hickel.

The parties to this conference are the official State water pollution control agency and the United States Department of the Interior. Participation in this conference will be open to representatives and invitees of these agencies and such persons as inform me that they wish to present statements. However, only the representatives of the Florida Department of Air and Water Pollution Control and the United States Department of the Interior constitute the conferees.

Now a word about the procedures governing the conduct of the conference. The conferees will be called upon to make statements. The conferees in addition may call upon participants whom they have invited to the conference to make statements. We shall call on other interested parties who wish to present statements.

At the conclusion of each statement, the conferees will be given an opportunity to comment or ask questions, and I may ask a question or two. This procedure has proven effective in the past in reaching equitable solutions.

Let me again make this clear. We will not have comments or statements from the audience at the conclusion of each statement. Just the conferees will be permitted to do so. However, just hold your statement or comment or question and you will be given an opportunity to be heard in order. No one will be cut off. We will be here until everyone has had his say and has been given a full opportunity to express himself, and I only ask that you be germane and try to be as brief as possible.

At the end of all the statements, we will have a discussion among the conferees and try to arrive at a basis of agreement on the facts of the situation.

Again without prejudging this case, it seems to me that we have such a complicated issue in Dade County that this probably will call for an executive session on the part of the conferees and then the conferees probably will have an announcement. I don't see really any other way to handle this situation.

I think we are faced with possibly an arch type of a pollution situation in this country. We are fortunate in one respect, that very probably the kind of pollutants you have here are the ordinary garden variety of pollutants that we know how to treat and are amenable to treatment. But yet we have such a complicated situation in view of the political subdivisions, the fast-growing area, the placement of the outfalls, that just getting a rational plan for dealing with these is very difficult indeed. And I would suggest if we are going to meet this problem and work our way through it, I ask for all your patience, to sit with us and work with us through this problem and let's try to get at the facts and follow the facts where they lead and not let any preconceived notions or philosophic conceptualisms get in our way, because if we do that the waters aren't going to know the difference and are still going to be dirty if they are dirty.

So we have to try to work this out, and I ask you to operate on this in a sense of good will. I think you will find, as far as I can see, that the State of Florida and the Federal Government are trying to work on this as one staff and we invite everyone else to join with us on this because I don't think that simplistic explanations are going to help us in trying to work our way through this. I am saying this at the very beginning because I want you, if you can, to approach the entire conference in that spirit.

Now, under the Federal law the Secretary of the Interior is required at the conclusion of the conference to prepare a summary of this which will be sent to the conferees. The summary according to law must include the following points:

Occurrence of pollution of navigable waters subject to abatement under the Federal Act, adequacy of measures taken toward abatement of pollution, and nature of delays, if any, being encountered in abating the pollution.

The Secretary is also required to make recommendations for remedial action if such recommendations are indicated.

And again I think this will be a major function of the conferees. We can make suggestions to the Secretary of the Interior as to his recommendations and I think this may be the key point in the conclusions of the conferees.

A record and verbatim transcript of the conference is being made by Mrs. Virginia Rankin. This is being made for the purpose of aiding us in preparing a summary and also providing a complete record of what is said here. It usually takes about three or four months for the transcript to come out in printed form and at that time it will be made available to you through your State agency. However, if you wish a copy beforehand, you should get in touch with Mrs. Rankin, who is an independent contractor, and make your own arrangements with her for the whole transcript or any part of it you may wish.

I would also like to indicate that we do not print in color. Therefore, if you have any charts, slides or visual aids when you come up and make a statement, please don't refer to color, that is the yellow patch here or the red spot there, because when someone reads the transcript that won't have much meaning.

I would suggest that all speakers and participants other than the conferees come to the lectern before they make their statement and identify themselves for the purposes of the record.

With that, I would like to ask Mr. Reed if he has a statement at this time.

Mr. Reed.

MR. REED: I have a letter from the Governor.

(The following letter was read by Mr. Reed:)

STATE OF FLORIDA

OFFICE OF GOVERNOR CLAUDE R. KIRK, JR.

October 20, 1970

Mr. Murray Stein
Federal Water Quality Administration
633 Indiana Avenue, Northwest
Washington, D.C. 20242

Dear Mr. Stein:

Welcome to Dade County. I urge you and your fellow conferees to develop a well-rounded and far-reaching set of recommendations which will serve as a guide for the development and implementation of an effective pollution control master plan.

Dade County is our largest urban area. Its growth and economic well-being are essential to the state of Florida. In spite of many years of sewage problems, the Dade County master plan has been allowed to become outdated and funds were never appropriated to complete a unified collection system and provide a protective degree of treatment.

Especially noteworthy are the problems of Miami Beach's outfall, the Miami River, the degree of pollution of the canal system, and the lack of communication between the cities and the metro-government.

There is a new team in being at Metro. There is a refreshing new spirit of interest in solving the alarming pollution problems being expressed by many civic-minded organizations and the Chamber of Commerce. I have received hundreds of letters requesting this conference. If you and your fellow conferees and staffs will make a maximum effort to delineate the steps needed to protect the public beach and the precious environment, you will have served a great purpose.

Mr. Murray Stein
October 20, 1970
Page Two

It is my fondest hope that Dade County and the municipal governments are ready to accept the responsibility of leadership and will become willing partners seeking joint solutions.

Sincerely,

Governor

CRK/wdw

NATHANIEL P. REED, CHAIRMAN
DEPARTMENT OF AIR AND WATER POLLUTION CONTROL
STATE OF FLORIDA, TALLAHASSEE, FLORIDA

MR. REED: I have a simple statement of my own, Mr. Stein, to the people who are in this room who have come here in common accord to try to find a solution to the problems in Dade County.

We are meeting today with only one objective in mind, to find and insist upon the implementation of a plan to solve the growing pollution problems of Dade County.

Before we leave this conference, I think we ought to make it perfectly clear that business cannot continue as usual. There must be a new set of priorities established by local government. The environment can no longer play second fiddle.

If we can come up with a timetable, a schedule, which we can hold local government to, I think the aroused citizens of this county will do the rest of the job.

I would like to pay special tribute to the Miami Herald, the Miami News, and the leading radio and television stations who have waged a continuing war on the growing menace of water pollution. If there ever was a community that should want to invest and publicly advertise the finest sewage treatment in the world, Dade County should be it. Her citizens have the most to gain and the most to lose as they start their all-out effort to preserve and enhance their community's environment.

Thank you.

MR. STEIN: Thank you, Mr. Reed.

I think with that kind of cooperation from the State and the localities that we can move ahead.

I would like just to make a little personal comment here. I would like to thank the Governor for asking us and welcoming us to Dade County. My family and I have been coming to southern Florida, to Dade County or a neighboring county, for winter vacations when the children are out of school for the past 10 years, and we are still doing it. I guess it is no secret to anyone that the reason we come here is largely for water recreation and clean water. I know you live with it and you are close to it here, but I am not sure that you really see the basic attraction that this has to get other people to come down, and that is precisely it.

Again thank you very much, Mr. Reed.

May we call on Mr. Thoman for the Federal presentation.

JOHN R. THOMAN

DIRECTOR, SOUTHEAST REGION

FEDERAL WATER QUALITY ADMINISTRATION

ATLANTA, GEORGIA

MR. THOMAN: As Mr. Stein indicated, this Federal-State enforcement conference is being held under the provisions of the Federal Water Pollution Control Act as amended. He has detailed the procedures to be followed and briefly discussed the responsibilities of the parties to the conference. For a brief moment I want to elaborate on these responsibilities.

The Federal relationships are primarily with the State. While Florida law permits the establishment of local pollution control programs under certain stated conditions, the Federal Water Quality Administration looks to the State agency as its prime contact and holds the State agency responsible for actions required or permissible under Federal law. As a consequence, only the State of Florida, represented by the Florida Department of Air and Water Pollution Control, and the Federal Government, represented by the Federal Water Quality Administration, are parties to this conference and will participate in its deliberations and subsequent actions.

At this time I would like to call on Mr. John Hagan, who is the Director of the Lower Florida project for the

Southeast Region, Federal Water Quality Administration, for the Federal report.

Mr. Hagan.

JOHN HAGAN, TECHNICAL DIRECTOR
LOWER FLORIDA ESTUARY STUDY AND OPERATIONAL
UNIT, FEDERAL WATER QUALITY ADMINISTRATION
FORT LAUDERDALE, FLORIDA

MR. HAGAN: Thank you, Mr. Thoman.

Mr. Stein, Mr. Reed.

I have a copy of the official report entitled Pollution of the Waters of Dade County, Florida. I will present this report in toto for the record and I will read then a summarization of this report.

MR. STEIN: Without objection, the entire report will be entered in the record as if read.

(Which report follows:)

POLLUTION OF THE WATERS
OF
DADE COUNTY, FLORIDA

MARCH 3, 1849

United States Department of the Interior
Federal Water Quality Administration
Southeast Water Laboratory
Technical Services Program
Lower Florida Estuary Study
Ft. Lauderdale, Florida

ERRATA SHEET

Pollution of the Waters of Dade County, Florida

Figures 8, 9, 11, 13 & 16	The solid line depicts 1968 data and the dashed line depicts 1969 data.
Pg 2, 3rd Para, line 1	114 should be 113.
Pg 15, 1st Para, line 1 & 2	114 should be 113.
2nd Para, line 1	twenty-one should be 22.
2nd Para, line 2	19 should be 18.
3rd Para, line 3	100.1 should be 100.9.
3rd Para, line 4	Miami should be Miami Beach.
Table 4	100.1 should be 100.9.
Pg 27, 4th Para, line 7	1969 should be 1968.
line 8	1968 should be 1969.
Pg 28, 3rd Para, line 4	4.1 should be 4.9.
Pg 32, 3rd Para, line 3	1.8 should be 2.9.
line 3	2.1 should be 2.4.
Pg 37, 2nd Para, line 1	12 should be 13.
Pg 38, 3rd Para, line 4	6,000 should be 6,900.
line 8	70 should be 90.
Pg 32, 3rd Para, line 4	D166 should be D164.
Figure 23	Mean BOD concentrations at D166 should be 2.9 in 1969 and 2.4 in 1968.

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INTRODUCTION

In July 1970, the Governor of Florida and the Florida State Air and Water Pollution Control Board requested assistance from the Federal Water Quality Administration in determining the pollution abatement requirements of Dade County.

This report discusses the effects on water quality of the numerous waste sources discharging into the canals, coastal waters and ocean in and adjacent to Dade County. The necessary actions required to alleviate the problem are also discussed. Data for this report were furnished by the Florida State Air and Water Pollution Control Board, and additional data were collected by the Federal Water Quality Administration, Lower Florida Estuary Study.

Cooperation and assistance in the form of data, reports and other information necessary to the preparation of this report have been extended by several agencies and individuals. Their contribution to this effort is gratefully acknowledged.

SUMMARY

Dade County has experienced sustained population growth for 40 years. The present population of 1.6 million is expected to increase to 2.7 million within 50 years.

About 500,000 to 800,000 people in Dade County are served by individual septic tanks for the disposal of sewage and domestic wastes. There is also a large, but undetermined, number of households which use individual wells for their domestic water supply.

There are 114 separate sewage treatment facilities serving the remaining 1.1 million people.

Approximately 74 of these systems are small package treatment units which serve an estimated half million population.

There are 40 major sewage treatment systems which serve 400,000 people. Thirty of these systems discharge treated effluent into the inland canal system. Four collection systems discharge through three ocean outfalls, and two of these outfall systems have no significant treatment prior to discharge.

At least eight treatment plants are known to be hydraulically overloaded although performance data on all the plants are not available.

The hydrology of Dade County is such that contaminated waters from the inland canal system of the Central and Southern Florida Flood Control District could adversely affect the quality of the ground water which is the source of all municipal water supply in the county.

The ground, surface, estuarine and ocean waters in Dade County are interrelated. The canals recharge ground water and receive water from the ground during dry periods, and they also discharge into Biscayne Bay while water from the Bay is exchanged with ocean water and vice versa.

Inland canal systems in northern Dade County have dissolved oxygen concentrations less than 4.0 mg/l and total coliform bacteria greatly in excess of 1000 MPN/100 ml. Degraded water quality is generally associated with known discharges of municipal wastes. Degradation of water quality increased from 1968 to 1969.

Canal systems in southern Dade County are generally not as severely polluted as those in the north. Two exceptions are Black Creek Canal and Military Canal which discharge severely polluted water into the vicinity of the Biscayne National Monument.

Water quality in the open waters of lower Biscayne Bay is excellent with respect to chemical and bacteriological indicators. Data are insufficient to draw conclusions as to the water quality of upper and central Biscayne Bay.

Coliform bacterial densities near the ocean outfall of the city of Miami Beach are extremely high, ranging from 5,400,000 to 54,000 MPN/100 ml. Coliform densities in the surf along Miami Beach occasionally exceed the criteria of 1000 MPN/100 ml required for recreational waters by the State of Florida.

CONCLUSIONS

It is concluded that:

1. Septic tanks, widely used in Dade County, are public health hazards and contribute to over-fertilization and algal nuisances in adjacent waterways.

2. The small package treatment units constitute a potentially significant source of organic and bacterial pollution.

3. The present methods for disposal through ocean outfalls without treatment require modification because of public health hazards and the detrimental effects on water quality.

4. The inland waters of northern Dade County are grossly polluted and are in violation of the Dade County and the federally adopted State of Florida Water Quality Standards.

5. The inland waters of southern Dade County are showing signs of severe water pollution as evidenced by fish kills in the area.

6. The major cause of poor water quality in Dade County is inadequately treated municipal sewage effluent.

7. Further study is needed to determine:
   A. Water quality of central and upper Biscayne Bay.
   B. The interrelationship between the canal system and the ground water and between the canal system and the estuarine and coastal waters.

RECOMMENDATIONS

To abate the existing gross pollution of the inland waters of Dade County and to provide a basis for the enhancement and management of future water quality of all the waters in the area, the following actions are recommended:

1. Completion of an up-to-date inventory of waste sources in Dade County with an evaluation of the performance of each of the 40 major treatment plants by April 1, 1971.

2. Immediate upgrading of existing treatment plant performance through improved operations.

3. Abatement of all wastes being discharged to the inland canal system of Dade County by January 1, 1973 -- the target date set by the Florida Air and Water Pollution Control Board and adopted by The Secretary of the Interior for compliance with approved water quality standards. All existing sewage systems should be regionalized into a county-wide system of central collection and treatment facilities with disposal of treated effluents to the ocean. Secondary treatment be provided for municipal wastes as required by the State of Florida before discharge to the ocean.

4. Inclusion in a county-wide sewage collection and treatment system of all areas presently served by individual septic tanks. Approved plans for sewage collection systems for these areas should be prepared by August 1, 1971 and coordinated with design and construction of adequate sewage treatment facilities. No permits should be granted for future construction of septic tank systems.

5. No future additional waste discharges to Lower Biscayne Bay and its tributaries including the Biscayne National Monument. Removal of existing municipal and industrial waste discharges should be considered for protection of the present high quality of these waters.

6. Review of the operations of the Central and Southern Florida Flood Control District to determine its effect upon the water quality of the inland canal system and the receiving estuarine waters.

7. Development of a regional water management plan, including quality and quantity, for the entire southeast Florida population corridor. Such a plan must be developed jointly by all local, State and Federal interests and should include considerations of advanced

waste treatment, groundwater recharge, waste water reclamation, control of freshwater discharge to the estuarine and ocean waters and the effects of future developments on the water quality and supply of southeast Florida.

AREA

Dade County is the largest county in Florida with an area of 2052 square miles, of which less than 200 is presently under development.(1) An additional 650 square miles of land in the county is readily developable. The land presently under development is on the Atlantic Coast Ridge, which extends down the east coast from the northern county line to Homestead. The remainder of the county, south and west of the Atlantic Coastal Ridge, consists of the Everglades. Most of the Everglades National Park is located in Dade County.(Figure 1)

The City of Miami is a light manufacturing center, in which the major types of production are: food products, fabric products, furniture and fixtures, printing and publishing, and fabricated metal products.(1) Industries producing these items account for 33.2 per cent of the total manufacturing firms in the Metropolitan Miami area.

The largest employers in the county are service organizations, including hotels and restaurants. Dade County is a major vacation resort, and in 1969 almost 200,000 overnight facilities were available.(1) Restaurants in the county had a seating capacity for over 200,000 customers. The center of the resort area is Miami Beach, which is located on the barrier islands that separate the eastern coast from the Atlantic Ocean.

The highly productive agricultural area south of Miami produces tomatoes, potatoes, limes, avocados, mangos and many other crops during the entire year. Biscayne Bay, another economic asset, is an important

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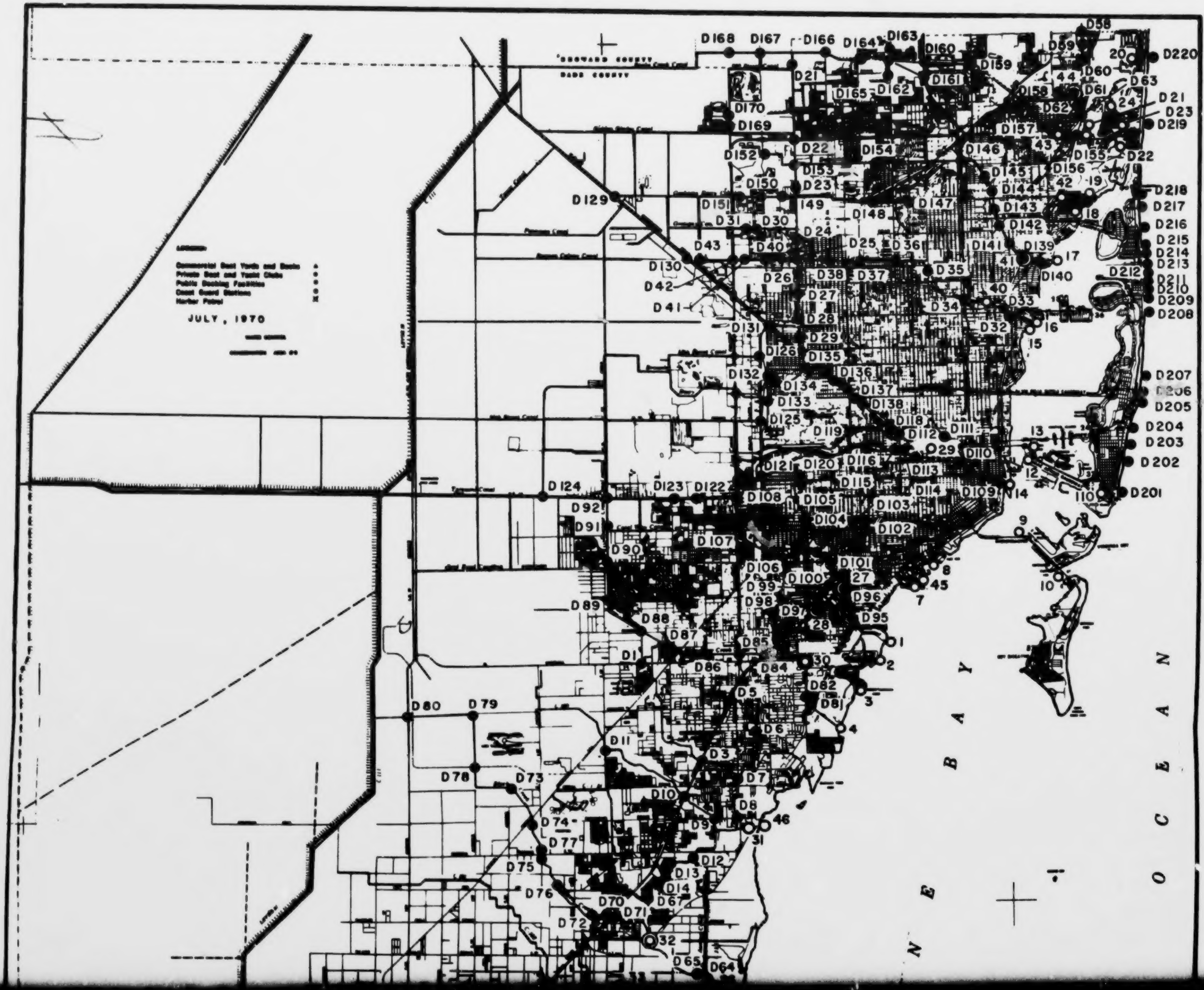
(1) Metropolitan Miami Manufacturers Guide, 1970.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Public Docking Facilities ●
Coast Guard Stations ●
Harbor Patrol ☒
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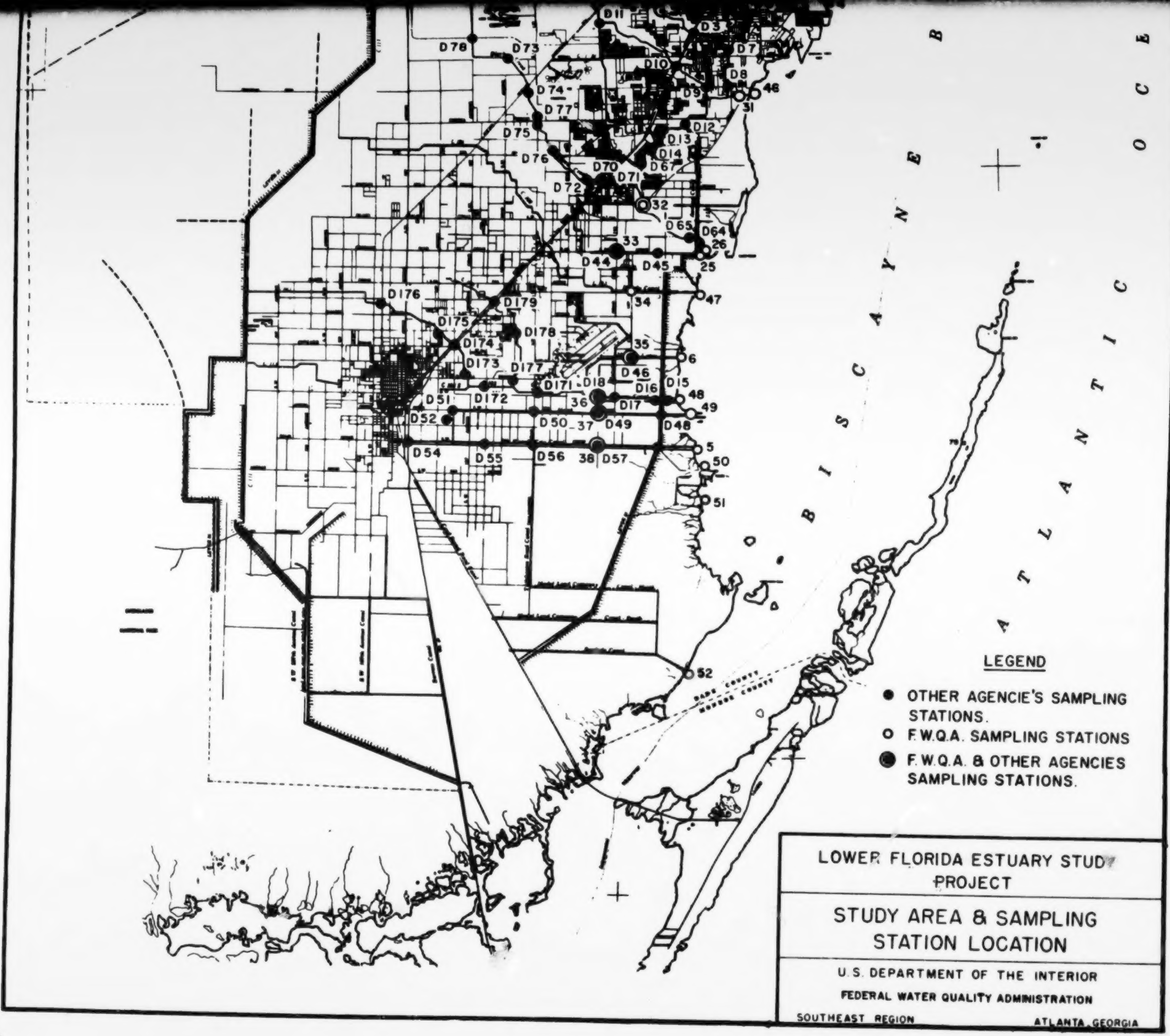
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LEGEND

- ● OTHER AGENCIE'S SAMPLING STATIONS.
- ○ F.W.Q.A. SAMPLING STATIONS
- ● F.W.Q.A. & OTHER AGENCIES SAMPLING STATIONS.

LOWER FLORIDA ESTUARY STUDY
PROJECT

STUDY AREA & SAMPLING
STATION LOCATION

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIG. 1

commercial fishery. In 1965, bait shrimp valued at $393,600, stone crabs valued at $145,828, and spring lobsters valued at $81,000 were landed in the bay.(2) The bay is also an extremely important recreation area, which is used for sports fishing, boating, water skiing, swimming and diving, among other uses.

CLIMATE

The climate of Dade County and all of southeast Florida is characterized by warm weather, usually ample rainfall and light but persistent winds. Mean annual temperature is around 75°F with summer highs about 82°F and winter lows about 67°F as a daily average. Record low temperatures of 26-28°F have been recorded in southern Dade County.

Average annual precipitation is about 60 inches/year. However, during hurricanes rainfall rates may be as high as 10 inches or more in 24 hours resulting in above average yearly rainfall and short term severe flooding. Rainfall deficiencies of up to 30.6 inches/year below average have also been recorded.

Wind speed averages about 9.3 miles per hour on a yearly basis. Here again, hurricanes offer an extreme condition with winds occasionally gusting over 100 mph. Calms ($<$3 mph) occur frequently but are usually of short duration.

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(2) Idyll, C. P., "Economically Important Marine Organisms in Biscayne Bay", Division of Fisheries Science, Institute of Marine Science, University of Miami.

"Climate" Reference: Water Resources of Southeastern Florida, USGS Water Supply Paper No. 1255, dated 1955.

Evaporation tests conducted around Belle Glade in Palm Beach County, resulted in an annual estimated evaporation rate of 64.33 inches/year. Special studies in the Miami area show the evapotranspiration rate to be about 35 inches/year. Thus up to 2/3 of the total precipitation may be lost, leaving a usable surface water supply of slightly over 20 inches/year.

HYDROLOGY

The major inland waterways in Dade County are canals which connect the Everglades and Conservation Areas 3A and 3B in the western part of the county with the urban and agricultural areas located on the coastal highlands adjacent to Biscayne Bay. Flow in these canals is controlled by structures operated by the Central and Southern Florida Flood Control District. The canals are operated to prevent floods, recharge the groundwater, and to prevent salt water intrusion.

During periods of heavy rainfall, the canals carry excess runoff to Biscayne Bay and reduce flooding of the low lands in Dade County. When rainfall is light the canals will be used to collect runoff from the urban areas for backpumping to the Water Conservation Areas, where groundwater recharge occurs.

All the canals discharging to Biscayne Bay are equipped with salinity dams which allow freshwater to flow into Biscayne Bay but prevent salt water from entering the canals.

Surface Water

The most significant waterways in Dade County with respect to hydrology are Snake Creek, Miami, Snapper Creek, Little River, Tamiami, and Biscayne Canals and Taylor Slough. The combined flow from the canals during the period 1960 to 1968 averaged 1460 cfs, which was 75 percent of the total eastward runoff from all Dade County Canals.(3)

Snake Creek Canal has the greatest discharge of any Dade County coastal canal. It is 21.5 miles long and has a drainage basin of 84 square miles.(4) Flow is regulated by two gated control structures, one at the eastern edge of Conservation Area 3B and the other near the mouth. During the 1960-to-1968 period, the average discharge at the salinity dam was 403 cfs, the highest flows occurred during September and October, and the lowest discharges were measured during March and April.

Miami Canal is Dade County's second largest coastal canal with a length of 20.0 miles and a drainage area of 111 square miles. The salinity control structure on this waterway is located 5.7 miles upstream of the mouth. The discharge just upstream of the salinity dam averaged 347 cfs during the 1960-to-1968 period. During this period, the highest discharges at this location occurred during September, October, and November, and the lowest occurred during April and May.

Flow and physical data for the remainder of the canals are presented in Table 1.

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(3) Hull, J. E. and Galliher, C. F., "Hydrologic Conditions During 1968 in Dade County Florida", USDI, Geological Survey, Water Resources Division, Tallahassee, Florida, March 1970.

(4) Gazetteer of Florida Streams, Division of Water Resources and Conservation, Florida Board of Conservation, Tallahassee, Florida, 1966.

TABLE 1

SUMMARY OF HYDROLOGIC AND PHYSICAL DATA
FOR
MAJOR DADE COUNTY CANALS

WATERWAY	LENGTH (2) MILES	DRAINAGE AREA (2) SQUARE MILES	AVERAGE DISCHARGE 1960 to 1968 cfs
Snake Creek Canal	21.5	84.0	403
Miami Canal	20.0	111.0	347
Snapper Creek Canal	12.0	42.6	263
Little River Canal	10.6	28.0	157
Tamiami Canal	17.0	55.0	144
Biscayne Canal	11.0	27.2	149
Taylor Slough (North of State Highway 27)	10.0	40.0	47.4

Taylor Slough is a natural drainage basin located in the eastern part of the Everglades National Park. Its headwaters are about ten miles north and west of State Highway 27, and it flows southward to Florida Bay. Its drainage basin north of State Highway 27 is approximately 40 square miles. The average discharge at Highway 27 was 47.4 cfs; however, there is no discharge at this location for long periods each year.

Ground Water

The principal source of potable, industrial and agricultural water supply in Dade County is the Biscayne aquifer. This is a highly permeable limestone and sandstone formation which is 80 to 150 feet thick on the east coast and diminishes to about ten feet thich on the western side of the county. Ground and surface water levels in Dade County are interconnected since the Biscayne aquifer extends to just below ground surface. The water table rises with local rainfall, surface water inflow and seepage from the conservation areas. On the other hand, it drops in response to losses by evapotranspiration, and surface water outflow.

The water table in northeastern Dade County has been relatively stable since the completion of the canal system in that area during 1955. The canal system in southeast Dade County was not complete as of 1968 and much greater fluctuation of the water table was observed in this area.(3)

There are two major municipal water supply well fields in the metropolitan Miami area. The Hialeah-Miami Springs well field is located in the vicinity of the Miami Canal and produced an average of 80 million gallons per day (mgd) in 1968.(3) The southwest Dade well field is located near the Snapper Creek Canal and its average pumpage was 60 mgd for 1968.(3) Figure 2 illustrates the annual average pumpage for the City of Miami well field from 1931 to 1968. The average pumpage has increased logarithmically from 11 mgd in 1931 to 140 mgd in 1968.

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(3) Hull, J. E. and Galliher, C. F., "Hydrologic Conditions During 1968 in Dade County Florida", USDI, Geological Survey, Water Resources Division, Tallahassee, Florida, March 1970.

Tidal Waters

Tidal waters of eastern Dade County consists of Dumfoundling Bay, Biscayne Bay and Card Sound, which are semi-enclosed tropical lagoons separated from the Atlantic Ocean by a narrow chain of barrier islands. The mean tidal range of the Atlantic Ocean near Miami Harber entrance is 2.5 feet. Biscayne Bay is connected to the ocean by broad shoals and deep narrow tidal surge channels. Tidal exchange of water between the ocean and Biscayne Bay and between Biscayne Bay and Card Sound is progressively retarded by shoals and keys. Reduced mean tidal ranges in Biscayne Bay and Card Sound graphically depict this flow retardation. The mean tidal range in upper Biscayne Bay is 1.9 feet and that in the lower bay was 1.4 feet. The mean tidal range in Card Sound is 0.8 feet.

POPULATION

Dade County has experienced a sustained population growth for about 40 years. This growth is expected to continue for the next 50 years. Table 2 shows the historical and projected population of the county from 1930 through 2020.

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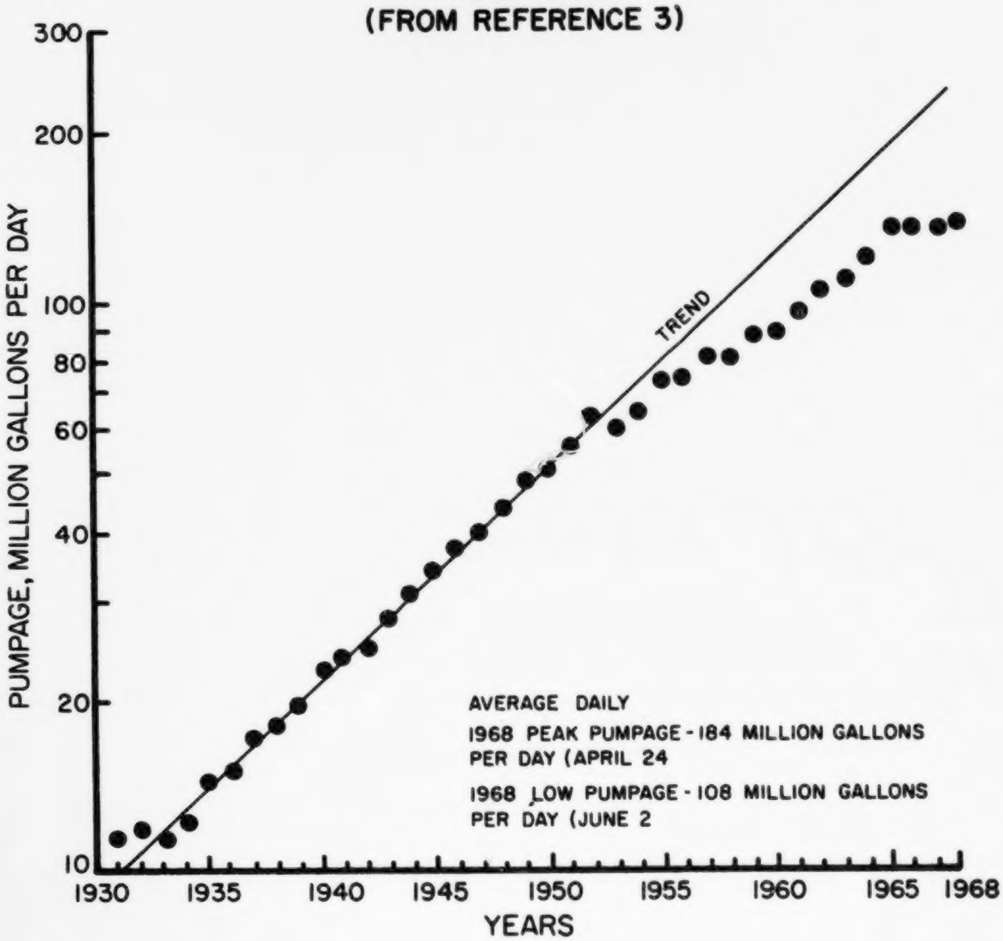
(3) Hull, J. E. and Galliher, C. F., "Hydrologic Conditions During 1968 in Dade County Florida", USDI, Geological Survey, Water Resources Division, Tallahassee, Florida, March 1970.

FIGURE 2

2 AVERAGE DAILY PUMPAGE
CITY OF MAIMI WELL FIELDS
1930-1968
(FROM REFERENCE 3)



AVERAGE DAILY

1968 PEAK PUMPAGE - 184 MILLION GALLONS PER DAY (APRIL 24

1968 LOW PUMPAGE - 108 MILLION GALLONS PER DAY (JUNE 2

TABLE 2

POPULATION

DADE COUNTY, FLORIDA

Year	Urban Population	Rural Population 1/	Total Residential Population	Occasional Residents and Tourists	Total Peak Seasonal Population
1930			142,995		
1940	215,590	52,149	267,739		
1950	466,079	29,005	495,084		
1960	894,342	40,705	935,100		
1970	2/	2/	1,259,184		
1980 3/	1,398,300	1,700	1,400,000	370,400	1,770,400
2000 3/	1,798,800	1,200	1,800,000	456,000	2,256,000
2020 3/	2,099,600	400	2,100,000	582,000	2,682,000

1/ Pre 1970 figures reflect population in rural areas, post 1970 figures reflect rural-farm population only.

2/ 1970 total population figures are preliminary only.

3/ Projections by Florida Social Sciences Advisory Committee, August 1969.

Preliminary 1970 census figures indicate 1,259,184 residents in Dade County. It is estimated that at the peak of the tourist season, there were about 320,000 tourists and occasional residents. Thus the total population for which municipal services should have been provided in 1970 was near 1,580,000.

Fifty year projections indicate a continued growth in both urban residential and tourist and occasional residents, with a severe loss in the rural-farm population.(5) Within the next decade, municipal utility services must be prepared to serve almost 1.8 million people and by 2020 these services must be available to almost 2.7 million people.

While Dade County has a total area of 2,052 square miles, much of the area is devoted to conservation areas and the Everglades National Park. It is estimated that the remaining area suitable for habitation development is only about 650 square miles.

A 1964 traffic study reports population densities as high as 377.6 persons per acre in a small section of downtown Miami and densities of over 100 persons per acre in 14 study areas covering 5,200 acres.

SOURCES OF DATA

Information on municipal waste sources was obtained from three inventories: FWQA STORET listings, State Department of Health and Rehabilitative Services inventory and State Department of Air and Water Pollution Control inventory.

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(5) Florida County Population Projections developed by the Florida Social Science Advisory Committee. August 1969.

Water quality data for the fresh water portions of the canal system originated with the Dade County Pollution Control Department and was obtained through the Florida Department of Air and Water Pollution Control. Water quality data for the estuarine portions of the canals and near shore areas of Biscayne Bay were collected by FWQA, Lower Florida Estuary Study.

Finally, coliform bacteria data from the bathing beach areas of the Atlantic Ocean were obtained from the Dade County Health Department and coliform bacteria data around the ocean outfalls came from Dade County Pollution Control Department.

After careful review, it was determined that inventory information is incomplete and out-of-date and that specific conclusions and recommendations regarding individual waste sources could not be made on the basis of that information. However, the water quality data are believed to be generally sound and reliable although several irregularities were noted in tabulated water quality data.

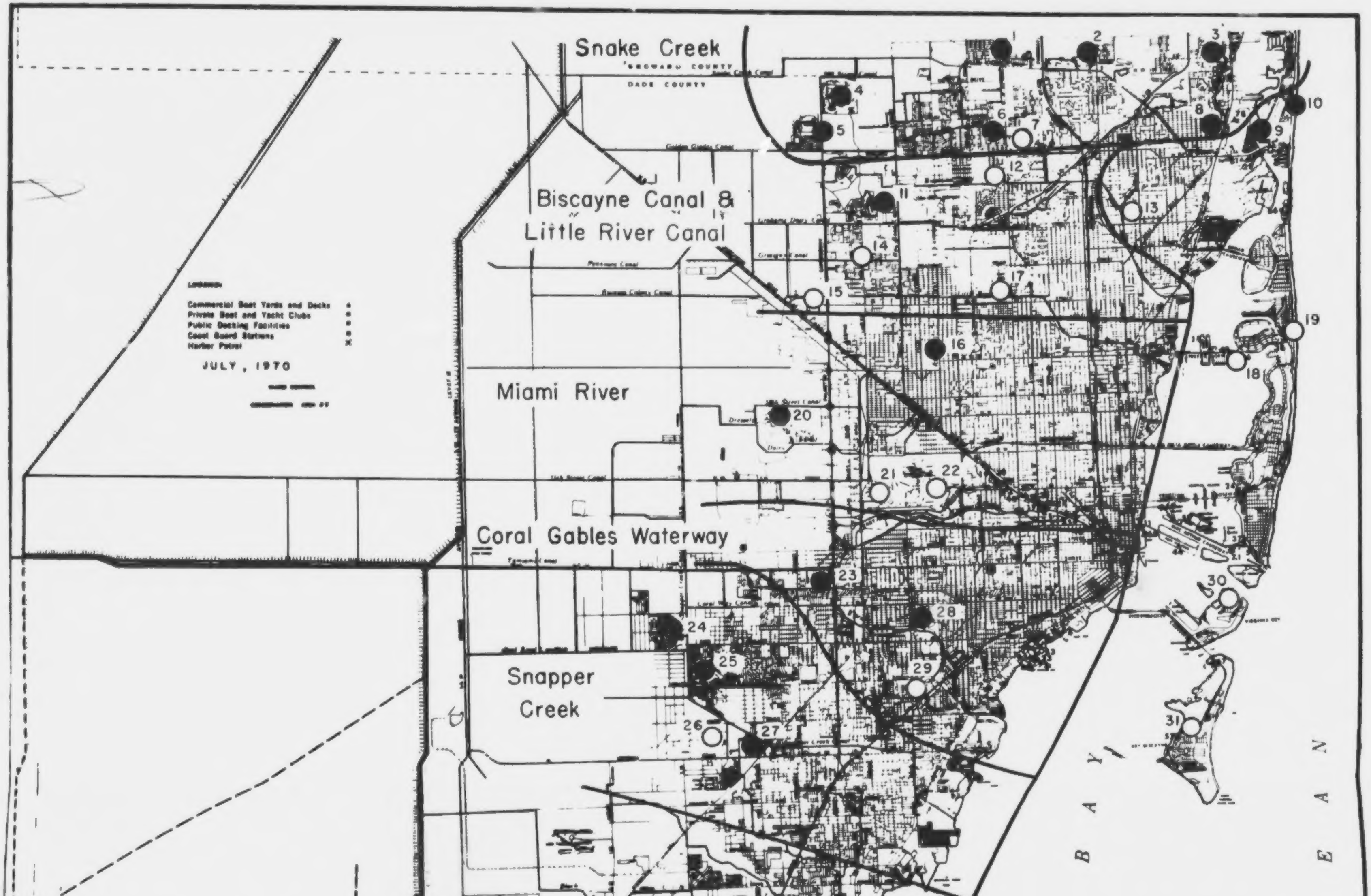
LEGEND:
Commercial Boat Yards and Docks
Private Boat and Yacht Clubs
Public Docking Facilities
Coast Guard Stations
Harbor Patrol
JULY, 1970
Snake Creek
BROWARD COUNTY
DADE COUNTY
Biscayne Canal &
Little River Canal
Miami River
Coral Gables Waterway
Snapper Creek
Black Creek
South Bay
BISCAYNE BAY
OCEAN
1
2
3
4
5
6
7
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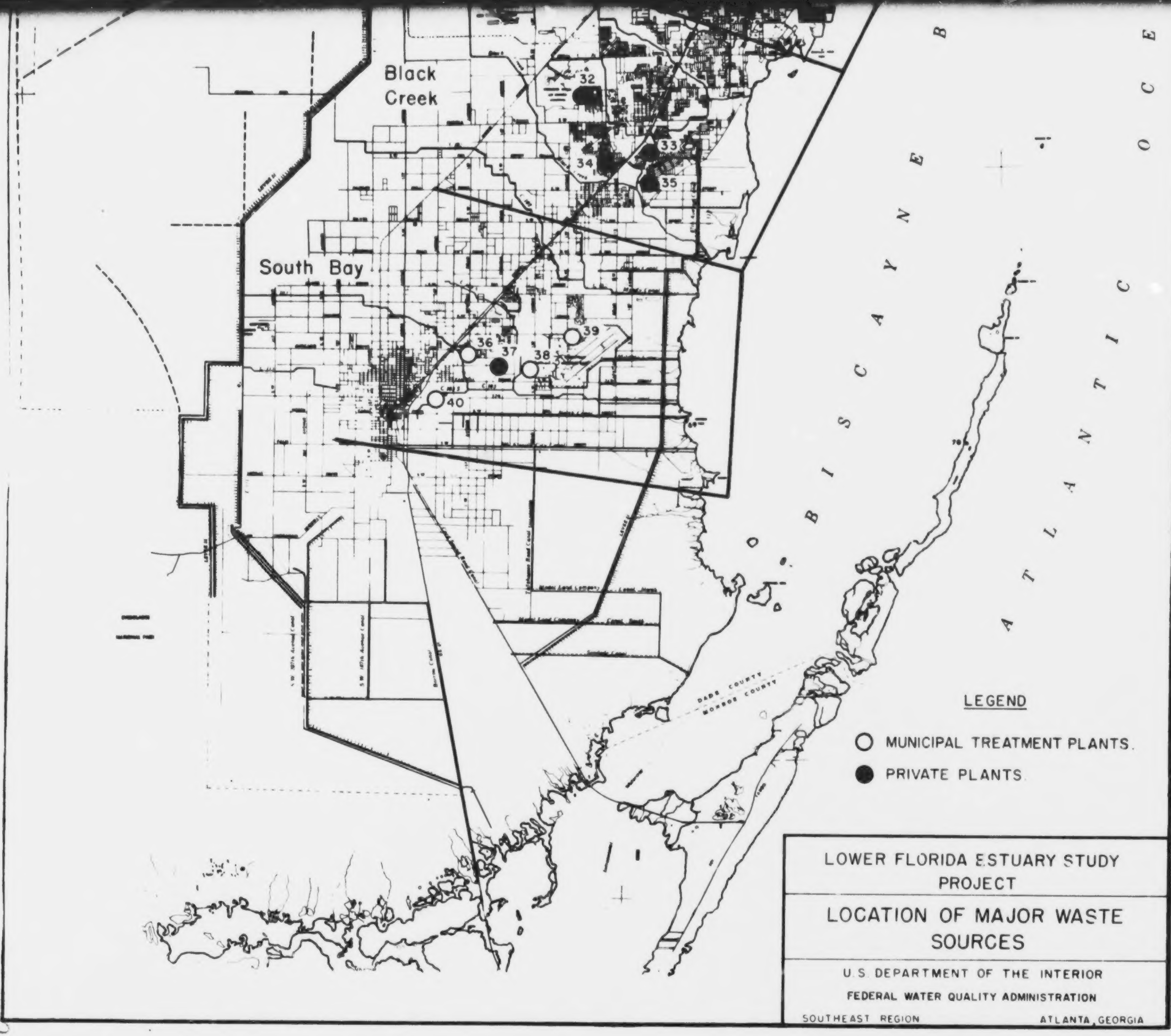
FIG. 3


Black Creek
South Bay
32
33
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36
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40
B I S C A Y N E B
A T L A N T I C O C E
DADE COUNTY
MONROE COUNTY

LEGEND

○ MUNICIPAL TREATMENT PLANTS.

● PRIVATE PLANTS.

LOWER FLORIDA ESTUARY STUDY PROJECT

LOCATION OF MAJOR WASTE SOURCES

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER QUALITY ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

WASTE SOURCES

MUNICIPAL WASTES

There are 114 separate sewage treatment installations in Dade County (Table 3). Of these 114, forty are considered major systems serving an estimated 421,700 persons. This represents only 27% of the total population served by sewage collection systems and major treatment plants (Figure 3).

Twenty-one of the 40 major treatment facilities are privately owned; the remaining 19 being owned by city, county or Federal governmental units.

County-wide treatment facilities have an installed capacity of over 181 million gallons per day (mgd) and an estimated actual flow of 100.1 mgd; however, almost all of the excess capacity is in two systems using ocean outfalls without treatment, namely North Miami and Miami. Design and flow data are not available for all the treatment facilities. Of 27 systems for which such data are available, eight are hydraulically overloaded. Those eight plants have an installed capacity of 5.6 mgd and an estimated flow of 7.9 mgd. They are: Riverdale Estates, Andover, Miami Lakes, Westwood Lakes, Snapper Creek Park, Bel-Aire (Perrine), South Miami Heights, and South Dade Labor Camp which is federally owned.

Thirty systems having a combined flow of 24.8 mgd discharge treated effluent into the inland canal system. These canals are operated for flood control and may have prolonged periods of minimal flow. In these

TABLE 3
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY*

Name of Source & Location	Avg. Flow		Population		Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
	Design	Actual	Equiv.	Served				
Andover S/D (2)	0.350	0.673	3500	1915			Tr. Filt.	Snake Crk. Canal
Atomic Sewerage Plant	0.030						Extended Aeration	FEC Canal
Barry College	0.030						Rated Aeration	Subsurface
Beaux Arts Apartments	0.022						Septic Tank & Sand Filter	Biscayne Bay
Beefster Restaurant	0.014						Extended Aeration	Subsurface
Bel-Aire S/D (33)	0.210	0.289	2100	2000			Trickling Filter	Ground
Biscayne Osteopathic Hospital	0.02						Extended Aeration	Snake Crk. Canal
Blue Lake Development Corporation								
Camp Matecumbe	0.035						Extended Aeration	Subsurface

* From listings furnished by The Florida Air & Water Pollution Control Board.

NOTE: Number in parenthesis indicates location of waste source on Figure 3.

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow		Population		Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
	Design	Actual	Equiv.	Served				
Carol City S/D (6)	3.5	2.2	35000	4620			Activated Sludge	Snake Crk. Canal
Carriage House Motel	0.018						Rapid Bloc	Subsurface
Casa Granada								
Chatlos Motel & Apartments	0.103						Trickling Filter	Dumfounding Bay
Coastal Towers Apartments	0.100						Septic Tank	Intracoastal Waterway
Cocoanut Grove Apt. Building	0.008						Extended Aeration	Biscayne Bay
City of Coral Gables (29)	2.5	2.36	10000	9650			Activated Sludge	Snapper Creek
Coral Reef Nursing Home	0.03						Extended Aeration	
Country Club Estates (4)	0.2	0.096	2000	1000			Contact Stabilization	Snake Crk. Canal
Dade County Home and Hospital (26)	0.135						Trickling Filter	Snapper Creek Canal

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow Design	Avg. Flow Actual	Population Equiv.	Population Served	Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
Dade County Junior College (17)	0.216		2160				Trickling Filter	Little River
Dade County Port Authority (Opa (12) Locka)	1.0		10000				Trickling Filter	Biscayne Canal
Doral Country Club (20)	0.216		2160				Contact Stabilization	Tamiami Canal
Dunes Shopping Center	0.012						Trickling Filter	Dumfounding Bay
Eagle Apartments House	0.011						Extended Aeration	Subsurface
Eastern Shores S/D (9)	0.300	0.166	3000	1000			Contact Stabilization	Intracoastal Waterway
Edelphi Building	0.013						Extended Aeration	Subsurface
FAA Air Route Control Center	0.009						Rated Aeration	58th St. Canal
Food Fair Store	0.015						Extended Aeration	Subsurface
Gelvan, Inc.								
Golden Isles S/D (3)	0.5	0.485	5000	3000			Contact Stabilization	Oleta River

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow Design	Avg. Flow Actual	Population Equiv.	Population Served	Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
Grove Bay Village Apartments	0.0175						Extended Aeration	Biscayne Bay
Helman Apartments	0.0063						Extended Aeration	Subsurface
City of Hialeah (Delray Gardens)	(15)0.04		400	400			Contact Stabilization	Canal C-7
City of Hialeah (Lake Cecile Estates)	(14) 0.210	0.205	2100	2000			Contact Stabilization	Gratigney Rd. Canal
Hialeah City Hall Complex	0.040							Subsurface
Hialeah Jr. High School	0.030						Extended Aeration	Subsurface
Hialeah Homes, Inc.	0.040							Canal C-7
Hialeah Race Course	(16) 0.120		1200	10000			Primary	Subsurface
Hilton Inn Motor Hotel	0.070						Extended Aeration	Miami River
Holiday Inn	0.0325						Extended Aeration	Miami River
Homestead Air Force Base	(39) 2.3		23000				Trickling Filter	Military Canal

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow Design	Avg. Flow Actual	Population Equiv.	Population Served	Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
City of Homestead (40)	1.2	0.99	12000	10000			Contact Stabilization	North Canal
Hot Shoppes Commissary	0.2						Mechanical Aeration	Tamiami Canal
Howard Johnson's Motor Lodge	0.025						Contact Stabilization	Tamiami Canal
International House of Pancakes	0.0075						Contact Stabilization	Bella Vista Waterway
Kendal Lakes S/D								
Key Biscayne Water Co. (31)	0.262	0.250	2620	1365			Trickling Filter	Atlantic Ocean via Virginia Key
Kelbba Apartments	0.038						Contact Stabilization	Snapper Crk. Canal
Lakeshore S/D								
Lasalle Immaculeta	0.021						Extended Aeration	Biscayne Bay
Leisure City (37)	0.262	0.220	2620	3100			Sand Filter	Subsurface
Man-Vil Co-Op Apartments	0.015						Extended Aeration	Snake Crk. Canal
Maule Lake S/D (8)	0.040		400				Contact Stabilization	Snake Crk. Canal

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow		Population		Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
	Design	Actual	Equiv.	Served				
City of Miami (30)	47.0	47.0	470,000	166,000			Activated Sludge	Atlantic Ocean
City of Miami Beach (19)	40.0	17.0		32,000			None	Atlantic Ocean
Miami International Airport #1 (22)	0.5	0.436	5,000	6,000			Trickling Filter	Tamiami Canal
Miami International Airport #2 (21)	0.5	0.346	5,000	5,000			Imhalf Tank	Tamiami Canal
Miami International Lodge Motel	0.022						Septic Tank Sand Filter	Tamiami Canal
Miami Lakes S/D (11)	0.175	0.258	1,750	2,000			Contact Stabilization	138th St. Canal
Mobile Home Park	0.035						Contact Stabilization	Drainfield
Mobile Homes Development	0.050						Contact Stabilization	Little River
Monsr. Race Sr. High	0.0275						Extended Aeration	Biscayne Canal
Nineteen Corp. Apts.	0.012						Extended Aeration	Little River

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow		Population		Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
	Design	Actual	Equiv.	Served				
North Bay Village (18)	0.8	0.45	8,000	2,600			Activated Sludge	Biscayne Bay
City of North Miami (13)	65.0	11.0	150,000	29,000			Pretreatment	Atlantic Ocean
Myrtle Grove S/D (7)	3.5	2.2	35,000	4,620			Activated Sludge	Coral City Canal
Palm Springs North S/D	0.445	0.305	4,450	4,000			Activated Sludge	Snake Crk. Canal
Palm Springs General Hospital (5)	0.050						Contact Stabilization	Little River
Palm Springs Village Shopping Center	0.104						Extended Aeration	Canal C-7
Pan American Hospital	0.019						Extended Aeration	Tamiami Canal
Parkview Hospital	0.012						Extended Aeration	Drainfield
Pool and Patio Apts.	0.0164						Extended Aeration	Drainfield
Redland Farm Labor Camp (36)	0.125	0.070	1,250	800			Trickling Filter	Subsurface
Riverdale Estates S/D (1)	0.350	0.49	3,500	955			Trickling Filter	Snake Crk Canal

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow Design	Avg. Flow Actual	Population Equiv.	Population Served	Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
Royal Glades Nursing Home	0.0075						Contact Stabilization	Golden Glades Canal
Royal Poinciana Motel	0.0125						Contact Stabilization	Drainfield
Salvric, Inc.	0.010						Contact Stabilization	Intra-coastal Waterway
Seaboard Ind. Park	0.10						Extended Aeration	Little River
Shoreview Towers Apts.	0.020						Rapid Bloc	Biscayne Bay
Skyline Motel	0.015						Extended Aeration	Tamiami Canal
Snapper Crk. Park S/D (27)	1.00	1.05	10,000	9,650			Activated Sludge	Snapper Creek
South Canal Homes S/D (35)	1.575	0.945	15,750	9,200			Activated Sludge	Black Creek
South Dade Labor Camp (38)	0.125	0.190	1,250	1,200			Trickling Filter	Drainage Canal
South Miami Heights S/D (34) (Perrine)	1.750	2.388	17,500	10,000			Activated Sludge	Black Creek to Biscayne Bay

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow		Population		Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
	Design	Actual	Equiv.	Served				
Southern Estates S/D (24) (OpaLocka)	0.525	0.475	5,250	1,685			Trickling Filter	Snapper Creek to Biscayne Bay
Southern Florida Sanitarium & Hospital	0.030						Extended Aeration	Drainfield
Sumars & Lift Porterhouse Steak Restaurant	0.0101						Extended Aeration	Closed Sand Filter
Sun City (Belmont Park) (10)	0.044	0.016	440	560			Activated Sludge	Dumfounding Bay
Sutton Place Apts.	0.026						Septic Tank	Drainfield
Tidewell Trailer Park	0.034						Extended Aeration	Tamiami Canal
University of Miami (32) (South Campus)	0.15		1,500				Activated Sludge	Sand Filter then leached into ground
Veterans Admin. Hospital (28) (Coral Gables)	0.300		3,000				Trickling Filter	Coral Gables Canal to Biscayne Bay

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow		Population		Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
	Design	Actual	Equiv.	Served				
W. L. Walker Trailer Park	0.0156						Septic Tank Sand Filter	Subsurface
West Coral Way S/D (Miami) (23)	2.050	1.500	20,500	12,390			Activated Sludge	Coral Gables Canal to Biscayne Bay
Westwood Lakes S/D (Miami) (25)	1.645	2.600	16,450	5,970			Trickling Filter	Snapper Creek Canal to Tamiami Canal to Biscayne Bay
Woody Bowling Alley	0.022						Extended Aeration	Tamiami Canal to Miami River
Zayre Dept. Store	0.015						Extended Aeration	Snake Creek Canal
Burdines (Hialeah)								
Farm Stores Inc. (Miami)								

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow		Population		Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
	Design	Actual	Equiv.	Served				
Florida Portland Cement								
Golden Gate Motel		0.857					Trickling Filter	Stream
Hialeah Ewing Plant (Hialeah)								
Holiday Acres Mobile Home Park (Miami)								
Kendall Complex							Trickling Filter	
Li'l Abner Mobile Home Park (Miami)								
Newport Resort Motel		0.000117					Septic Tank	Ocean Outfall
Red Lion Restaurant (Miami)								
Royal Colonial Trailer Park (Miami)								

TABLE 3 (CONT'D)
DOMESTIC WASTE SOURCE INVENTORY
DADE COUNTY

Name of Source & Location	Avg. Flow Design	Avg. Flow Actual	Population Equiv.	Population Served	Effluent BOD P.E.	Removal Efficiency % BOD	Type of Treatment	Receiving Stream
Sun City Hotel N. Miami	0.085						Activated Sludge	Biscayne Bay
Sweden House (Miami)								Drainfield
The Castaways (Miami Beach)								
Valleydale Packers (Miami)							Extended Aeration	
Zippy Chocolate (Miami)							Extended Aeration	

sluggish waters sewage pollution in the form of dissolved and suspended organic material, solids deposits and bacteria can accumulate to such concentration as to cause nuisance and health hazards.

Four collection systems having a combined flow of 75.0 mgd discharge into the Atlantic Ocean through three outfalls (Miami, Miami Beach, North Miami). North Miami discharges about 11 mgd of raw sewage through an 11,000 foot outfall. Miami Beach provides no treatment but discharges about 17 mgd of raw sewage through a 6900 foot outfall at a depth of about 40 feet. The City of Miami outfall discharges an estimated 47.0 mgd about 4600 feet off shore at a depth of only 16 feet. This plant provides intermediate activated sludge treatment prior to discharges. No figures are available as to the treatment efficiency provided by this plant.

Three systems discharge an estimated 0.6 mgd to the intracoastal waterway and Biscayne Bay and, finally, three systems discharge an estimated 0.5 mgd to the ground through drain fields. A summary of the flows and receiving streams major discharges is given in Table 4.

Primary treatment plants, which consist essentially of settling tanks and sludge digesters, can remove most settleable solids, about one-third of the BOD, and approximatedly 50 percent of the bacteria. Secondary plants include secondary biological treatment units, such as oxidation lagoons, trickling filters, or activated sludge systems. Such plants can remove 90 to 95 percent of the BOD, suspended solids and coliform bacteria. Chlorination facilities for disinfection of properly treated sewage can destroy more than 99 percent of the sewage bacteria. To accomplish these reductions, however, treatment facilities must be properly designed, have adequate operating funds, and be skillfully operated.

TABLE 4

SUMMARY OF MAJOR WASTE SOURCES BY DRAINAGE BASIN

Name of Watershed	Estimated Flow (mgd)	Number of Plants
Snake Creek	6.4	8
Biscayne & Little River	1.7	5
Miami	1.0	3
Coral Gables	4.2	3
Snapper Creek	4.3	4
Black Creek	3.5	3
South Bay	3.7	4
TOTAL TO CANALS	24.8	30
Atlantic Ocean	75.0	4
Intracoastal Waterway	.6	3
Ground	.5	3
TOTALS	100.1	40

Septic Tanks

The Hollis Report(7) estimates that there are 143,000 septic tank installations in Dade County serving an estimated half million people. Based on 1970 population figures and estimated population served by treatment facilities, as many as 837,000 people may be on septic tanks or are discharging raw sewage. This represents 58% of the 1970 population. The shallowness of the water table, porosity of the shallow aquifer and the number of private wells used for water supply and lawn irrigation present opportunities for contamination and constitute a definite health hazard.

Conclusions developed from a comparative study of canals in areas served by sewers and by septic tanks state that higher BOD and lower D.O. in the lower levels and luxuriant algae growth in the surface layer of canals in the septic tank area can be attributed to septic tank effluent.(8) Thus, there is evidence that, in addition to causing a health hazard, septic tanks may contribute to the total load of pollution material carried by the waterways in their drainage area.

Package Units

There are about 74 plants serving apartment houses, trailer parks and shopping centers which are small extended aeration package units or septic tanks. Kiker(9), in work done on small plants throughout the State of Florida, including Dade County, concluded that these package units functioned properly only if operation and maintenance was adequate and that in most cases it was not. Of 14 plants tested, only three met the current State requirement of 90% BOD reduction.

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(7) Notations of the Ad Hoc Committee on Environmental Determinants in the tri-county area of Dade, Broward and Palm Beach Counties, M. D. Hollis, Chairman, May 1970.

(8) Pollution of Canals by Septic Tanks, Master Thesis by Thomas Paul Jackivicz, University of Miami, June 1969.

(9) Kiker, J. E., Jr., "Package and Subdivision Sewage Treatment Plants," Journal WPCF, Vol. 32, No. 8, August 1960.

In most instances, the small package plants discharge to the nearest convenient waterway. Furthermore, they usually serve facilities with a highly mobile and variable population, a factor which contributes to poor performance. No estimate can be made of the total load of pollution from these sources since performance and loading data are not reported in the inventory, but the number of plants in this category would suggest they may be a significant source of pollution.

INDUSTRIAL WASTES

No data are presently available to FWQA concerning the identity, number or location of industrial waste discharges, or the load or effects on water quality of such discharges.

SUMMARY

Due to incomplete waste source data, only general conclusions can be reached.

Only about one-third of the resident population is known to be served by major sewage collection and treatment facilities. Of the 40 major facilities, at least eight plants are known to be hydraulically overloaded.

Over one million people in Dade County are served by septic tanks and small package plants for the disposal of sewage and domestic wastes.

An accurate inventory of all municipal and industrial waste sources and a determination of the waste load which each contributes to the waterways and their treatment plant performance are a first and very basic requirement.

WATER QUALITY STANDARDS

Florida State water quality standards were approved and adopted by the Secretary of the Interior on January 17, 1969. Under sections 28-5.21 and 28-5.09 of the Rules of the Florida Air and Water Pollution Control Commission, all waters in Dade County are classified as Class III: Recreation Propagation and Management of Fish and Wildlife, except the Miami River which is Class V: Navigation, Utility and Industrial use. Section 28-5.01 expresses the "intent of the State of Florida to review Class V stream classifications periodically as often as necessary, and as water quality of such areas improves, hearings will be held and reclassification shall be established. It is expected that in all instances, presently classified as Class V waters, there shall be decided and definitive enhancement not later than January 1, 1973."

A summary of Class III water quality criteria from Section 28-5.09 is as follows:

1. Wastes shall be effectively treated,
2. pH not more than ± 1.0 unit from normal,
3. dissolved oxygen not artificially depressed below 4.0 mg/1,
4. coliform bacteria not to exceed 1,000 per 100 ml as a monthly average,
5. free from toxic substances,
6. free from nuisance-causing discharges,
7. turbidity shall not exceed 50 units above normal,
8. temperature shall not cause damage to the aquatic environment.

Additionally from Section 28-5.04(3), the presence of nitrates and phosphates in any amounts shall be suspected of degrading water quality.

Effluent standards under Section 28-5.04 require a minimum of 90% treatment of organic material for both municipal and industrial wastes. Additional treatment may be required as needed to meet water quality criteria of the receiving waters.

The Dade County Pollution Control Ordinance (No. 67-95 dated 12-19-67) Section 24-11, as amended, contains the following criteria: dissolved oxygen must be 5.0 mg/l for at least 10 hours per day but never less than 4.0 mg/l; and coliform bacteria are limited to 1000/100 ml without regard to monthly averages. No distinction is made in classification of waters and all waters are subject to the same quality criteria.

Section 24-13 of the Dade County Ordinance added by Ordinance No. 70-44 (06-02-70) concerns septic tanks. "Where public water supply is used, no septic tank shall be installed . . . where greater than 1500 gallons/day per unsubmerged acre of land will be generated by the actual or projected use." Where public water supplies are not used the allowable discharge shall not exceed 750 gallons/acre/day.

WATER QUALITY

GENERAL

Sewage contains a variety of obnoxious constituents which can damage water quality and restrict its use. Sewage contains astronomical numbers of intestinal bacteria which were released in man's excretions. Some of these bacteria may be pathogens which can infect man with a variety of diseases.

Oxygen-demanding materials found in sewage can limit or destroy fish, shellfish, fish food organisms, and other desirable aquatic life by removing dissolved oxygen from the water.

The oxygen demand of sewage, as measured by the five-day biochemical oxygen demand (BOD) test, indicates their potential for reducing the dissolved oxygen content of the waters. The coliform bacteria content of raw and treated sewage discharged to a water-course indicates the density of sewage associated bacteria, which may include disease-producing organisms.

NORTHERN DADE COUNTY CANALS

Most of the data discussed in this report were collected by the Dade County Pollution Control Department during 1968 and 1969. Additional data were collected by the Federal Water Quality Administration, Lower Florida Estuary Study.

The mileages reported for the locations of sampling stations, intersecting canals, and sewage treatment plants are approximate. Distances along the canals were measured from the mouth of the canal when possible.

Canals reported to have serious pollution problems are discussed in detail in this section. They are: Miami River, Coral Gables Waterway, Snapper Creek, Biscayne Canal, Tamiami Canal, Little River Canal, Snake Creek Canal, and Oleta River.(10) Relatively unpolluted canals discharging into lower Biscayne Bay are discussed briefly. All canals discussed except the Miami River are classified for Recreation and Propagation and Management of Fish and Wildlife (Class II).

Sampling station locations are presented in Figure 1 and Appendix A-1 and a summary of the Federal Water Quality Administration data is presented in Appendix A-2.

Coral Gables Waterway

The Coral Gables Waterway begins at the Tamiami Canal and extends approximately 7.2 miles to the northern part of middle Biscayne Bay. Approximately 1.2 miles above the mouth the canal branches into two channels which join again at mile 2.7. The northern branch of the canal is 1.5 miles long and the southern branch has a length of 2.5 miles. At mile 3.9, a salinity dam near Red Road halts the passage of boats up the canal. West of the dam the waters of the canal are fresh and unaffected by the tide; east of the dam, the canal is a tidal estuary.

In 1968, all the sampling stations in the north branch and main canal had mean dissolved oxygen (D.O.) concentrations less than the Federal, State, and local standards of 4 mg/l except one--D95, at mile 0.9. The mean D.O. concentration at this station was 4.8 mg/l and the minimum was 2.0 mg/l. The lowest mean D.O. concentration of 1.9 mg/l occurred at Station D104, just below the salinity dam. This station is 0.2 miles upstream of the Veterans Administration Hospital Sewage Treatment Plant (S.T.P.) which discharges 0.3 million gallons per day (mgd) of treated sewage into the canal. This reach of the canal is affected by the tide, and waste discharges would be distributed both up and downstream of their points of entry. The mean D.O. for 1968 of water entering from the Tamiami Canal was 3.2 mg/1, measured at Station D108. Downstream of this station 1.5 mgd from the West Coral Way Subdivision enter the Coral Gables Waterway. Figure 4 illustrates the D.O. depression below this discharge. The critical point in this reach occurs at mile 4.9, where the mean D.O. was 2.1 mg/1 in 1968. D.O. concentrations in the south branch of the Coral Gables Waterway were considerably higher than in the north branch. The highest mean concentration was 6.0 mg/1, in 1968, at Station D99, which is in Student Lake on the University of Miami campus. The minimum concentration at this station was 2.8 mg/1, which is also in violation of Federal, State, and local standards. The City of Coral Gables Sewage Treatment Plant discharges 2.4 mgd of treated effluent into the south branch of the canal.

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(10) Letter dated July 23, 1970, Paul Leach to Vince Patton.

In general, mean D.O. concentrations in 1969 were lower than they were in 1968. At most stations, the 1969 values were about 1.0 mg/1 lower, indicating a deteriorating water quality. In 1969, the mean D.O. of the water entering the Coral Gables Waterway from the Tamiami Canal was 1.4 mg/1, which was considerably lower than the average concentration of this water in 1968. In the fresh water reach of the canal, the D.O. was 2.8 mg/1 at Station D105 west of the salinity dam. The data for 1969 do not reflect the effect of the West Coral Way Subdivision Sewage Treatment Plant. D.O. depletions due to discharges from the Veterans Administration Hospital S.T.P. and the City of Coral Gables S.T.P. are clearly depicted in Figure 4. The lowest mean D.O. concentration in 1969, 2.0 mg/1, occurred at Station D102, which is at mile 3.3. The D.O. at this station in 1969 never exceeded 4.0 mg/1.

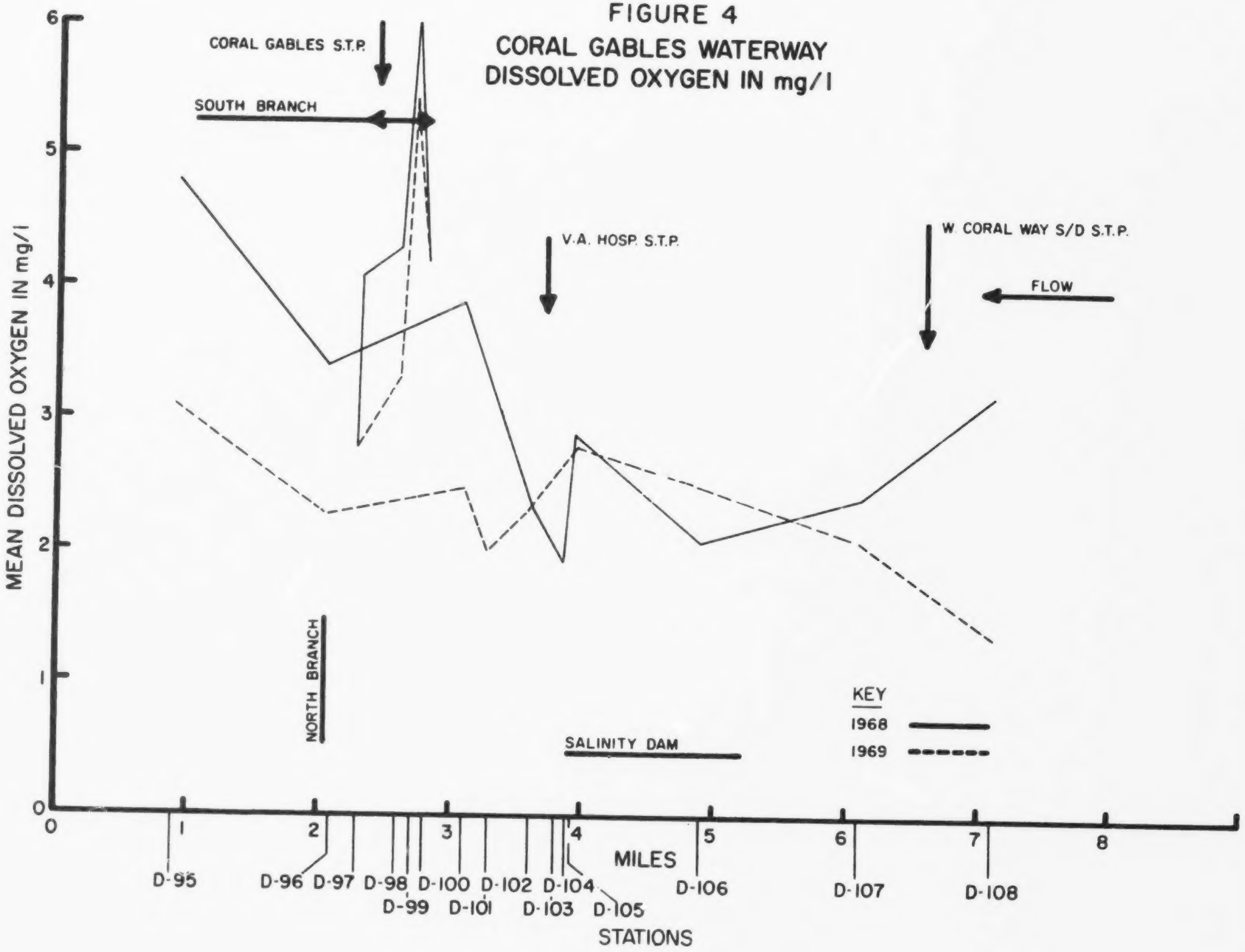


FIGURE 4
CORAL GABLES WATERWAY
DISSOLVED OXYGEN IN mg/l

The five-day biochemical oxygen demand (BOD) concentrations in the Coral Gables Waterway were significantly greater in 1969 than 1968, again indicating an increase in the quantity of waste discharged to the waterway. Extremely high mean BOD concentrations of 9.2 mg/l in 1968 and 8.3 mg/l in 1969 were observed at Station D107, approximately 0.5 mile downstream of the West Coral Way Subdivision S.T.P. In the estuarine reach of the waterway, the mean BOD concentration increased upstream of both sewage treatment plants in this reach (Figure 5).

Upstream of the salinity dam very high coliform bacteria densities were observed below the West Coral Gables S.T.P. A mean density of 104,600 MPN per 100 ml in 1968 and a mean density of 46,400 MPN per 100 ml in 1969 were observed at this location.(Note) Excessive bacterial densities were also observed in the vicinity of the two sewage treatment plants located downstream of the salinity dam. Bacterial densities in 1969 were generally lower than those in 1968. A profile of total coliform bacteria concentrations in the Coral Gables Waterway is shown in Figure 6. All stations in the Coral Gables Waterway had total coliform densities which violated the federally adopted State of Florida Water Quality Standards of 1000 MPN per 100 ml, as well as those of Dade County during most times in 1968 and 1969.

Miami River Canal

The Miami River Canal flows from Lake Okeechobee in a southeasterly direction through the water conservation area into upper Biscayne Bay just north of the Rickenbacker Causeway. The section of the waterway discussed in this report is the lower 15 miles. A salinity dam at mile 5.2 near N. W. 36th Street regulates flows and prevents saltwater intrusion. The river below the dam is a tidal estuary.

Note: Coliform bacteria means are calculated and reported by Dade County Pollution Control as arithmetic average rather than the more customary logarithemic average.

FIG.5

CORAL GABLES WATERWAY
BIOCHEMICAL OXYGEN DEMAND IN mg/l

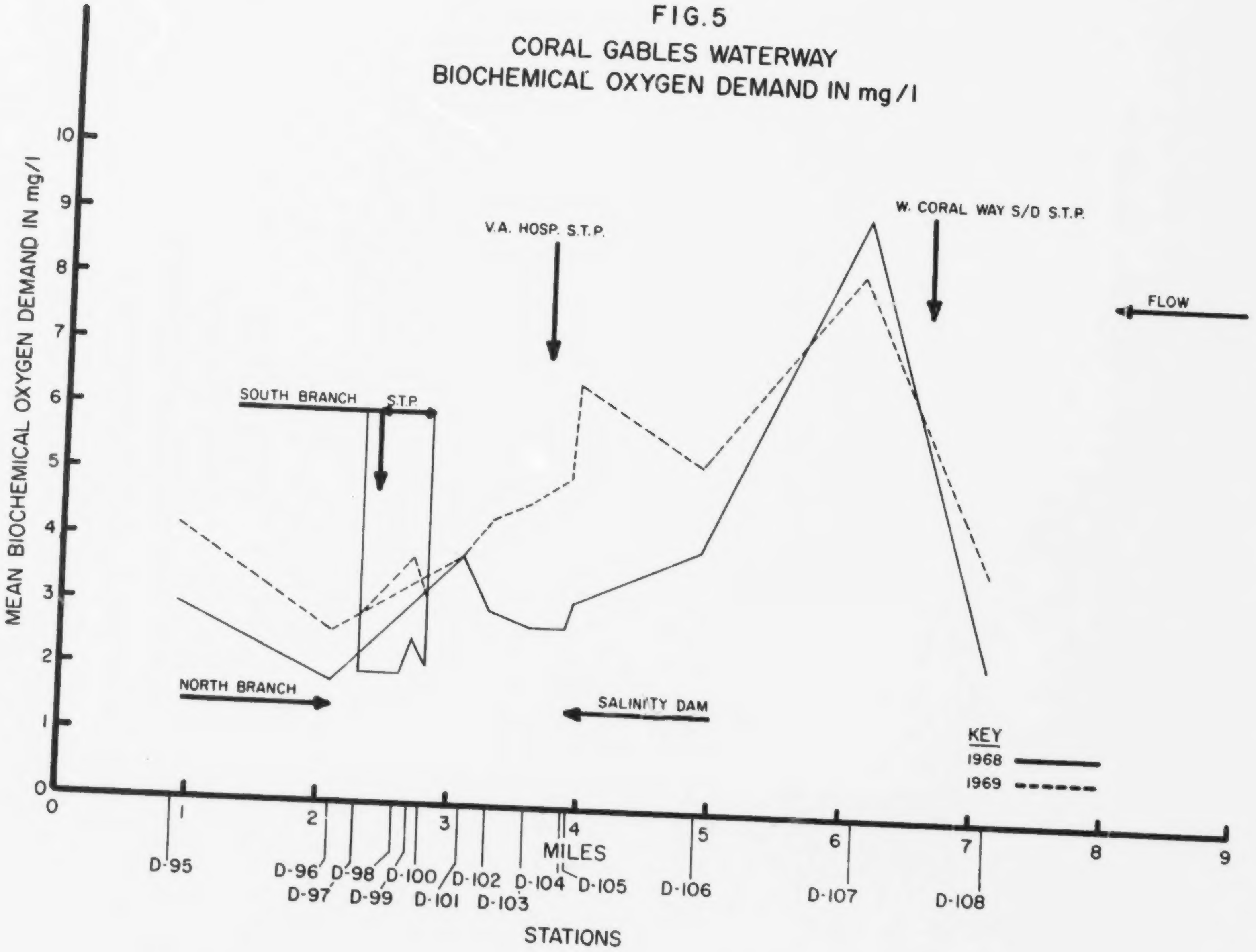
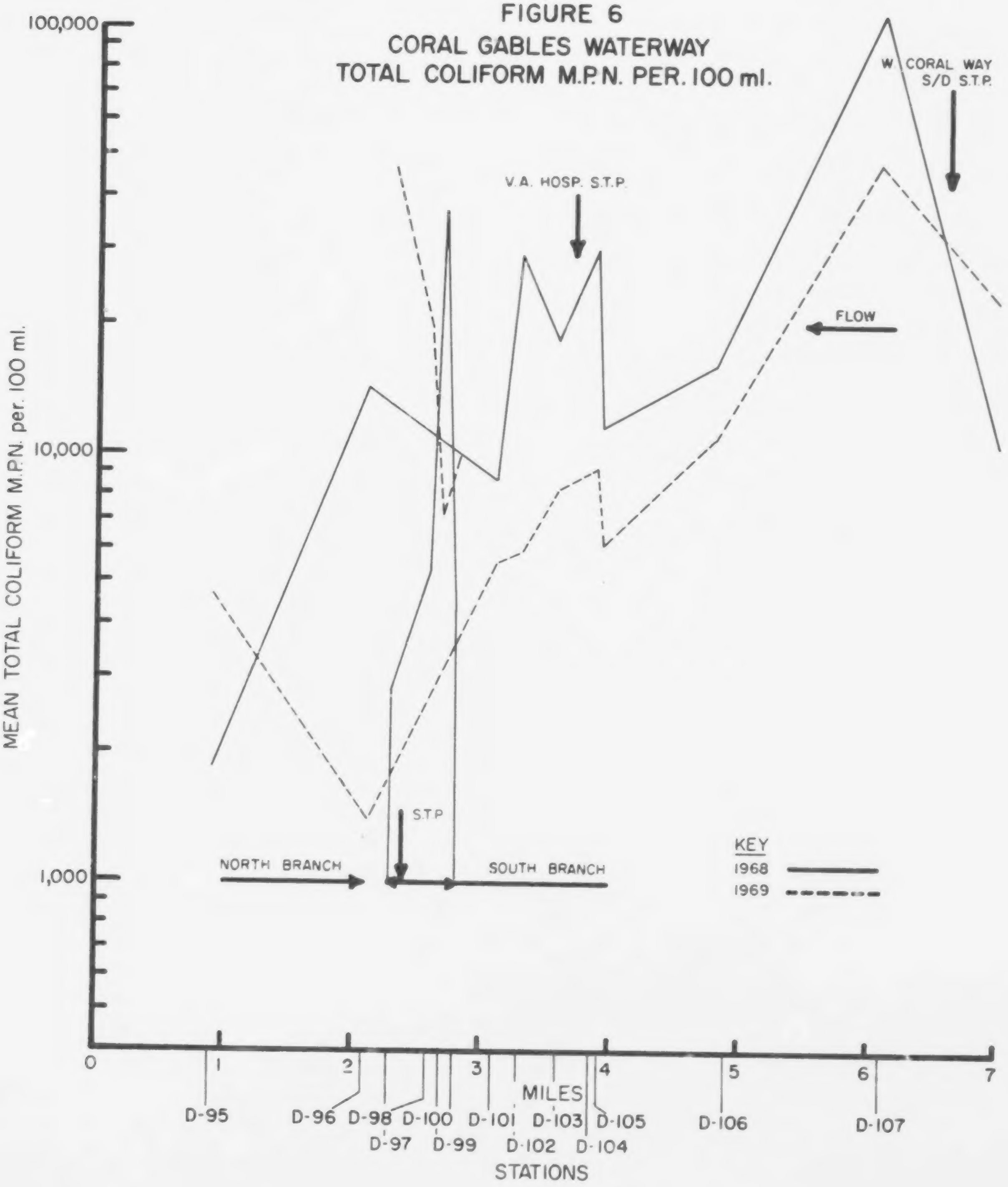


FIGURE 6
CORAL GABLES WATERWAY
TOTAL COLIFORM M.P.N. PER. 100 ml.



The Miami River Canal is polluted by the raw sewage discharged from numerous apartments, private homes, industrial and commercial establishments, and from houseboats and live-on boats. A Dade County Pollution Control report (11) indicates that more than 910,000 gallons per day (gpd) of raw sewage is discharged to the waterway. In addition, 22,000 gpd finds its way into the river from drainfields and 22,600 gpd is discharged by houseboats and live-on boats. The report also states that 145,000 gpd of treated effluent is discharged by five small sewage treatment plants and that during storms 1,764 million gallons per day of storm water runoff reaches the river from 86 storm sewer outfalls.

As shown in Figure 7, dissolved oxygen (D.O.) concentrations upstream of the salinity dam were extremely low, and the concentrations observed in 1968 and 1969 were approximately the same. Mean D.O. concentrations in this reach ranged from 1.6 to 1.1 mg/l. Below the salinity dam, the lowest mean D.O. concentrations were observed at Station D138, which is just downstream of the dam. Mean concentrations at this location were 1.3 mg/l in 1968 and 1.0 mg/l in 1969. The maximum concentrations observed at this location were 3.6 mg/l in 1968 and 2.0 mg/l in 1969. The highest mean D.O. concentrations in the river, 2.6 mg/l in 1968 and 2.5 mg/l in 1969, were observed at Station D109 near the mouth. Dissolved oxygen in the Miami River was also measured by the FWQA. An average concentration of 5.6 mg/l was found at Station 14, near the mouth and of 2.8 mg/l at Station 29 downstream from the Comfort Canal entrance. All mean D.O. concentrations in the Miami River were well below the 4.0 mg/l standard, indicating that an extremely serious pollution

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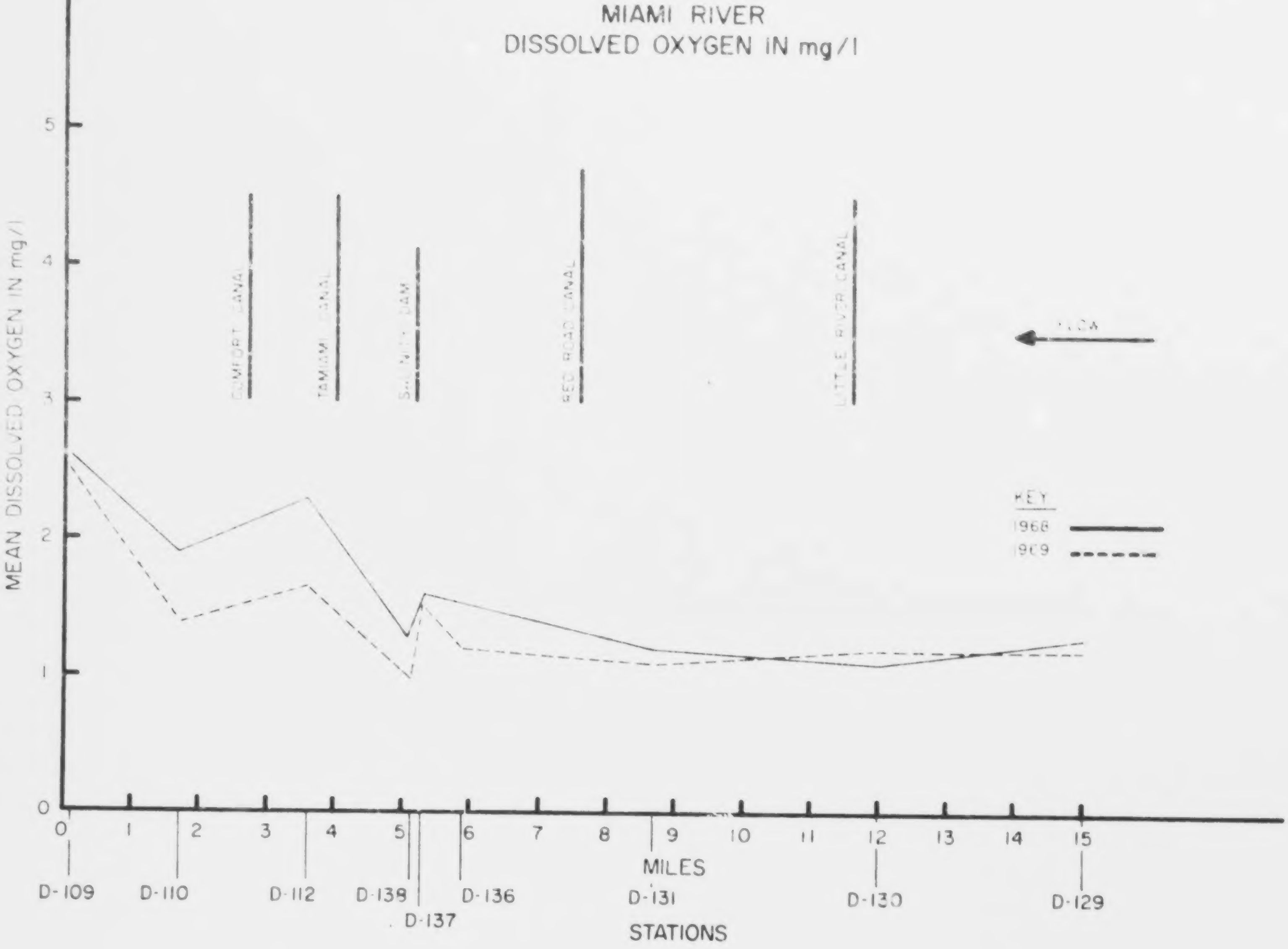
(11) Schmitx, J. J., "Report on Water Conditions and Pollution Sources of the Miami River and its Tributaries", Dade County Pollution Control, August 8, 1969.

FIGURE 7
MIAMI RIVER
DISSOLVED OXYGEN IN mg/l



problem exists. The Federal-State classification for the Miami River is for navigation, utility and industrial use and is required only to be aerobic. However, the Dade County standards make no such exception and its criteria are being violated.

Concentrations of biochemical oxygen demand were greater in 1969 than in 1968. The highest mean value in the fresh water reach of the canal was 4.3 mg/l in 1969 at Station D136, mile 0.7, upstream from the salinity dam. Downstream of the dam the highest mean of 5.9 mg/l in 1969 was found at the mouth of the river. The BOD profile for the Miami River is shown in Figure 8.

The FWQA study found an average of 1.2 mg/l of BOD at the mouth and 1.0 mg/l downstream from the Comfort Canal entrance.

In 1969 all mean total coliform concentrations in the fresh water reach of the river exceeded the 1968 concentrations and in the saline reach of the river the reverse was observed. Most mean total coliform densities violated the 1000 MPN per 100 ml standard, with the exception of Station D129, mile 15, which were 869 MPN per 100 ml in 1969 and 590 MPN per 100 in 1968. The highest mean bacterial densities occurred at Station D110, mile 1.7, and they were 215,000 PMN per 100 ml in 1969 and 66,000 PMN per 100 ml in 1968 (figure 9).

The Miami River is so acutely polluted that if it were backpumped as proposed it could cause serious pollution problems in the water conservation areas. Water from the river also serves to recharge the groundwater supply and pollution of groundwater could eventually occur if water quality in this canal remains the same or deteriorates further.

FIGURE 8
MIAMI RIVER
BIOCHEMICAL OXYGEN DEMAND IN mg/l

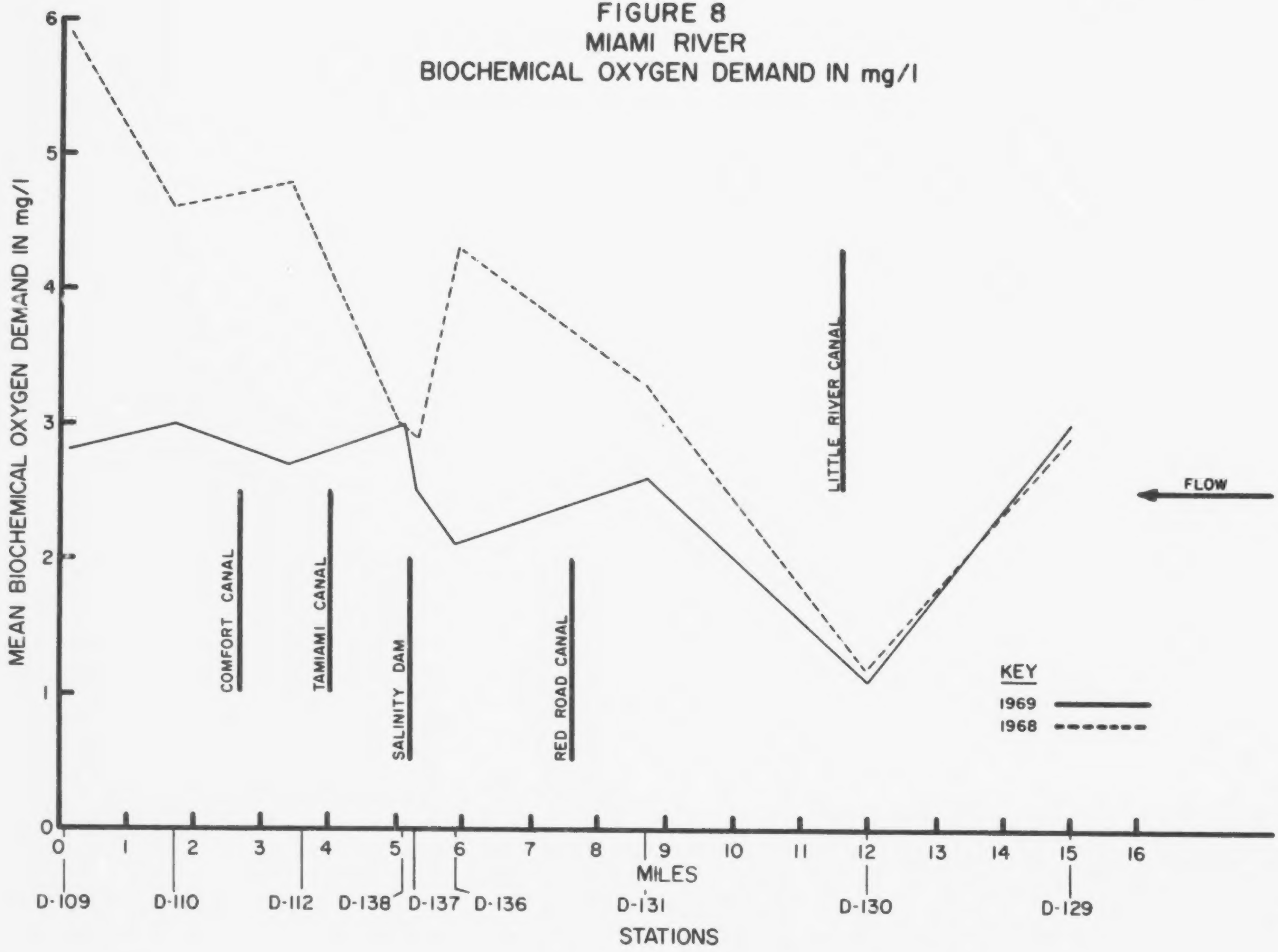
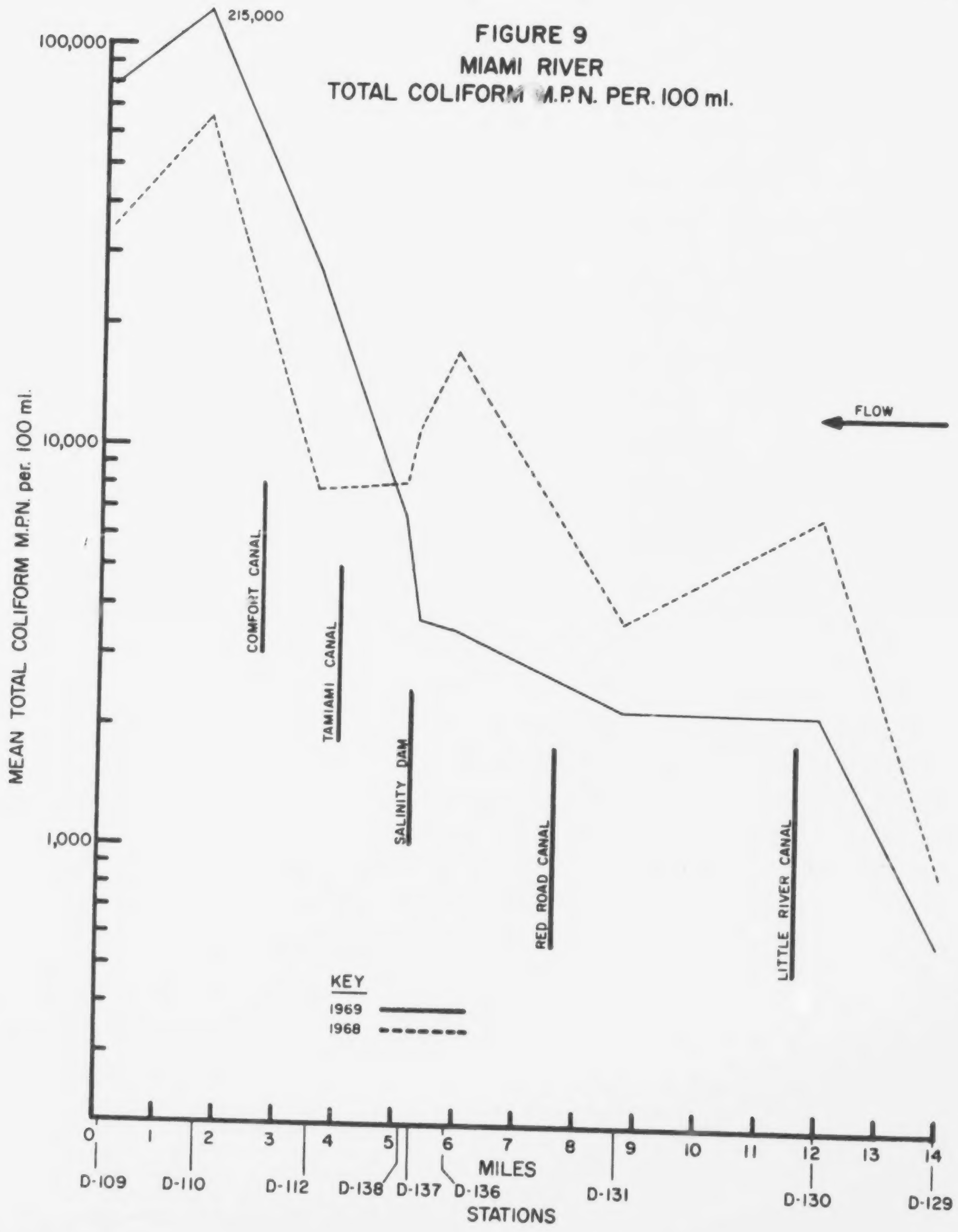


FIGURE 9
MIAMI RIVER
TOTAL COLIFORM M.P.N. PER. 100 ml.



Snapper Creek Canal

The Snapper Creek Canal extends 12 miles from the Tamiami Canal to central Biscayne Bay. A spillway, located at Red Road approximately 1.3 miles above the mouth of the canal, controls flows in the canal and prevents saltwater intrusion. Three major sewage treatment plants discharge into the Snapper Creek Canal. The largest discharges 2.6 million gallons per day (mgd) and serves the Westwood Lake Subdivision. The Snapper Creek Park Subdivision S.T.P. discharges 1.05 mgd of effluent into the canal and the Southern Estates subdivision plant discharges 0.475 mgd.

Mean dissolved oxygen concentrations in Snapper Creek were extremely low during the 1968-1969 study period. The 1968 mean values ranged from 1.7 to 0.8 mg/l. Conditions were even worse in 1969, when the mean D.O. concentration ranged from 1.4 to 0.5 mg/l, with only one station having a mean D.O. concentration greater than 1.0 mg/l. The mean D.O. at the mouth of the canal was 5.0 mg/l, and 2.7 mg/l at Station 30, mile 2.6, during the FWQA study. The D.O. profile of the Snapper Creek Canal is presented in Figure 10. Dissolved oxygen concentrations violate both Federal-State and county standards.

As would be expected, the biochemical oxygen demand (BOD) concentrations in the Snapper Creek Canal were extremely high and the mean values in 1969 generally exceeded those in 1968 (Figure 11). The highest mean BOD concentrations of 4.1 mg/l in 1968 and 4.5 mg/l in 1969 occurred at Station D87, mile 6.7, just downstream of the three waste discharges. Mean BOD values decreased from D87, mile 6.7, to D85, mile 4.6, and then increased again downstream. Mean BOD concentrations measured during the FWQA study were 1.2 mg/l at the mouth and 3.9 mg/l at mile 2.6. All mean coliform densities exceeded 1000 MPN per 100 ml (Figure 12).

FIGURE 10
SNAPPER CREEK CANAL
DISSOLVED OXYGEN IN mg/l

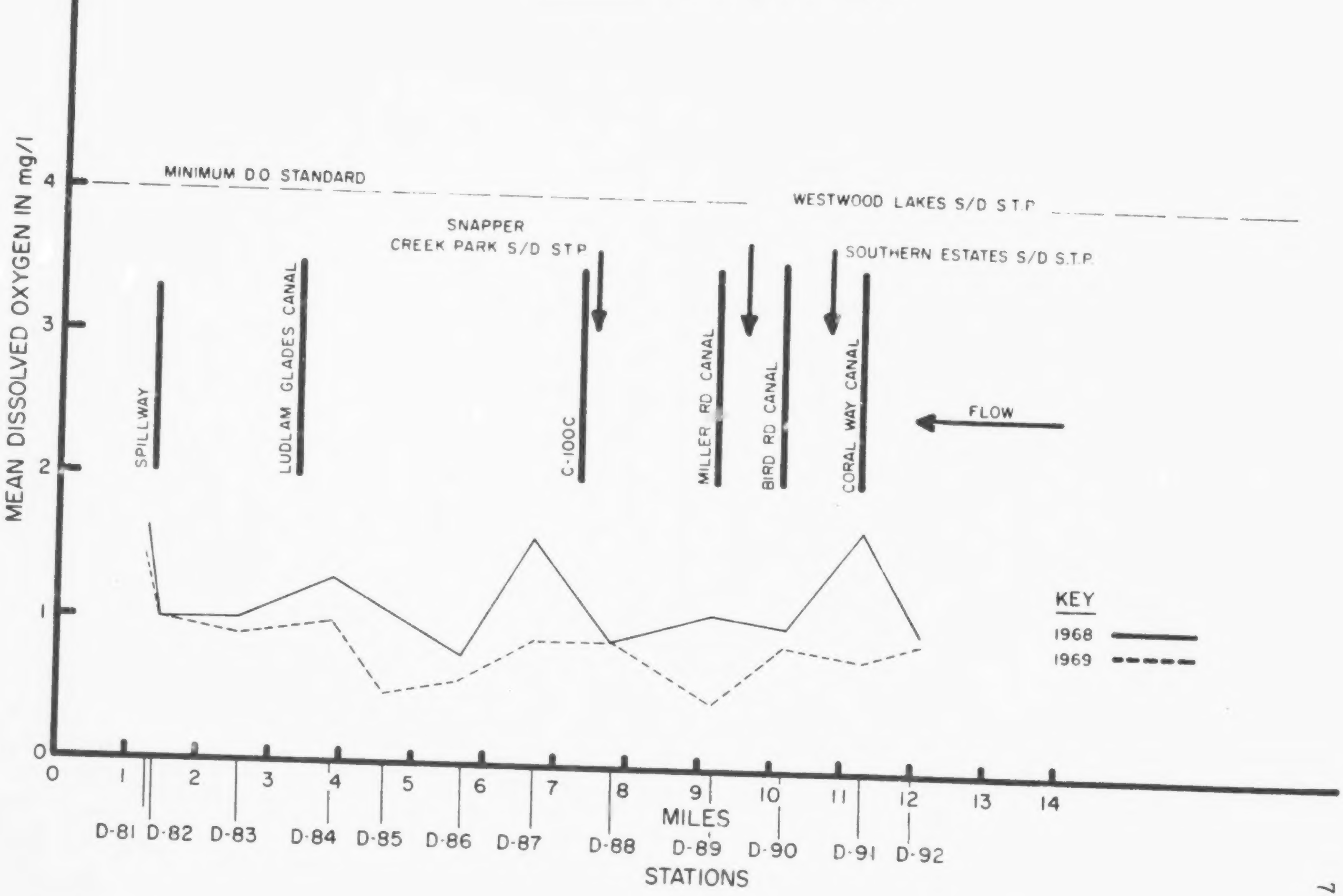


FIGURE II
SNAPPER CREEK CANAL
BIOCHEMICAL OXYGEN DEMAND IN mg/l

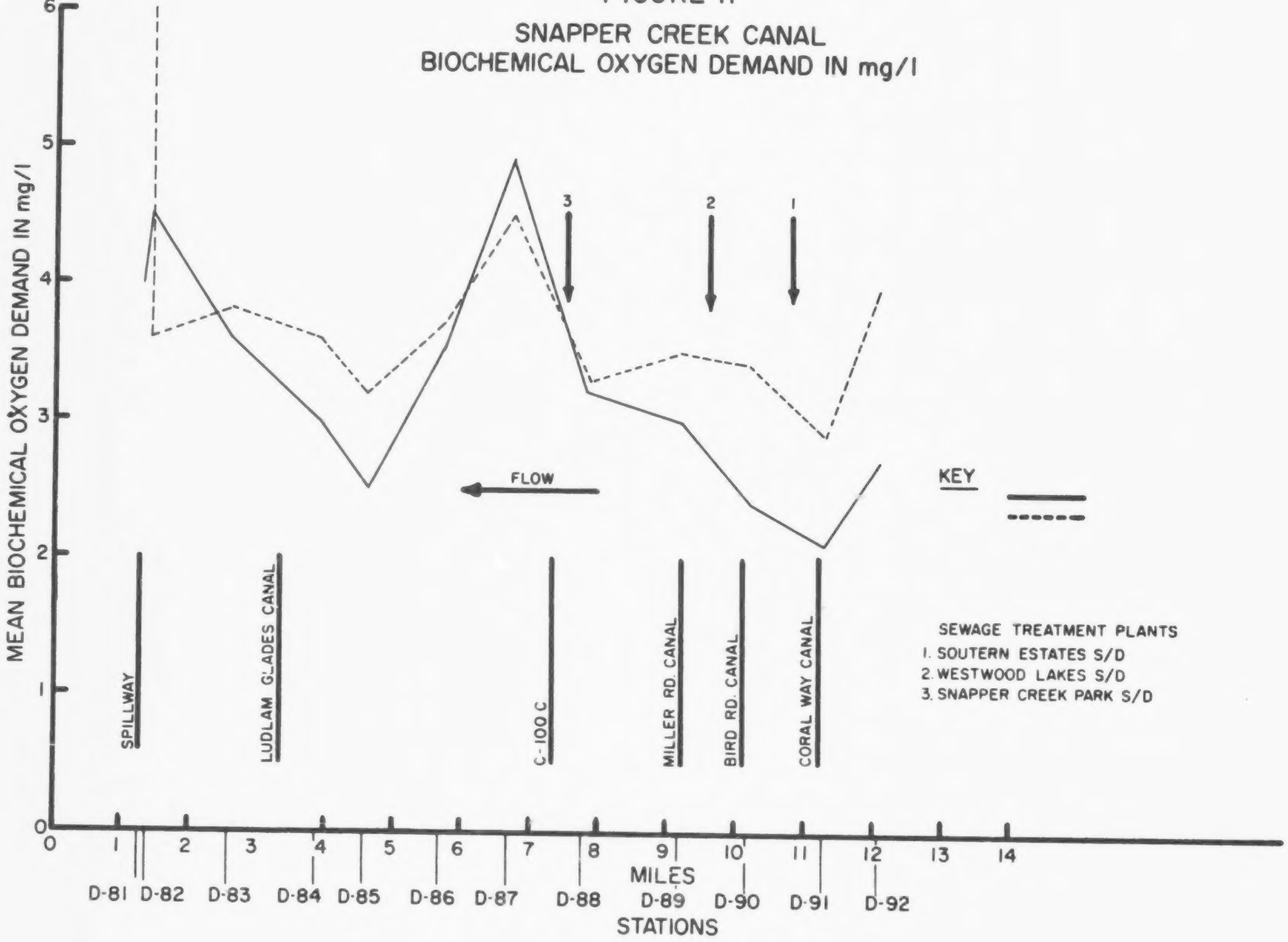
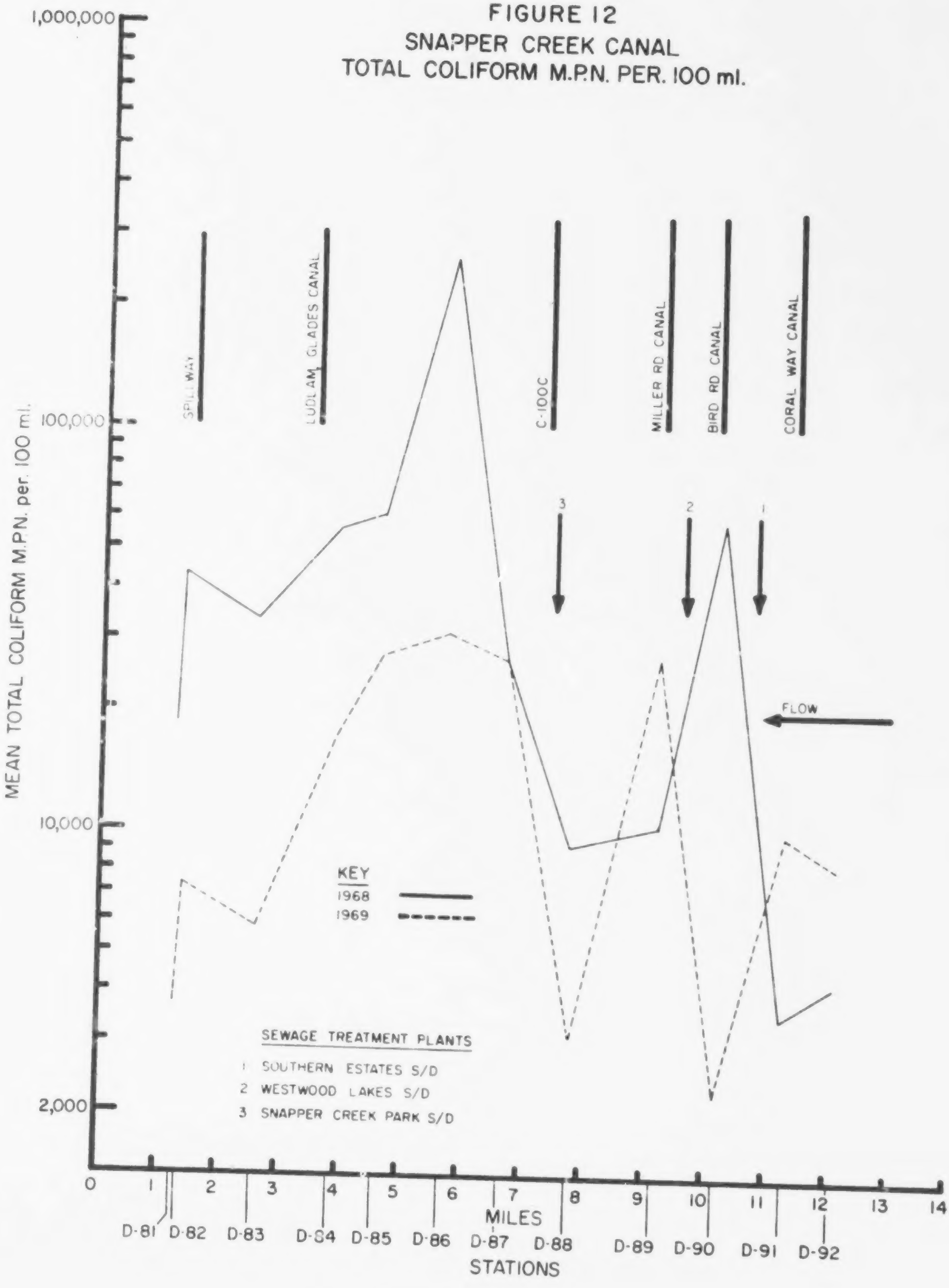


FIGURE 12
SNAPPER CREEK CANAL
TOTAL COLIFORM M.P.N. PER. 100 ml.



Biscayne and Opa Locka Canals

The Biscayne Canal has a length of approximately 12 miles and flows from the Palmetto Expressway to upper Biscayne Bay between the Broad and 79th Street Causeways. The Opa Locka Canal extends from the Palmetto Expressway to the Biscayne Canal and has a length of approximately 7 miles. The only major sewage treatment plant discharging into the Biscayne Canal is the Dade County Port Authority S.T.P., which has a design flow of 1.0 mgd. There are no known major discharges to the Opa Locka Canal. A spillway is located on the Biscayne Canal, five miles upstream of the mouth.

The dissolved oxygen profiles for the Biscayne and Opa Locka Canals are presented in Figure 13. The mean 1968 D.O. concentrations in the Biscayne Canal were greater than 4.0 mg/l, with the exception of a concentration of 3.8 mg/l below the spillway. In 1969, only three stations had concentrations equal to or greater than 4.0 mg/l. This represents a drastic deterioration in the quality of the water. Water quality also deteriorated between 1968 and 1969 in the Opa Locka Canal based on D.O. The FWQA study found an average D.O. concentration of 6.0 mg/l and an average BOD concentration of 1.2 mg/l at Station 17 near the mouth of the Biscayne Canal. At Station 41, just upstream of the spillway, the mean D.O. was 8.3 mg/l and the mean BOD was 3.1 mg/l.

At most stations the mean BOD was greater in 1969 than in 1968 (Figure 14). An extremely high mean BOD of 7.9 mg/l in 1969 was found at Station D139 just upstream of the spillway in the Biscayne Canal. A high mean BOD of 7.7 mg/l in 1969 was observed at Station D149, mile 10.1, in the Opa Locka Canal.

FIG. 13
BISCAYNE & OPA LOCKA CANAL
DISSOLVED OXYGEN IN mg/l

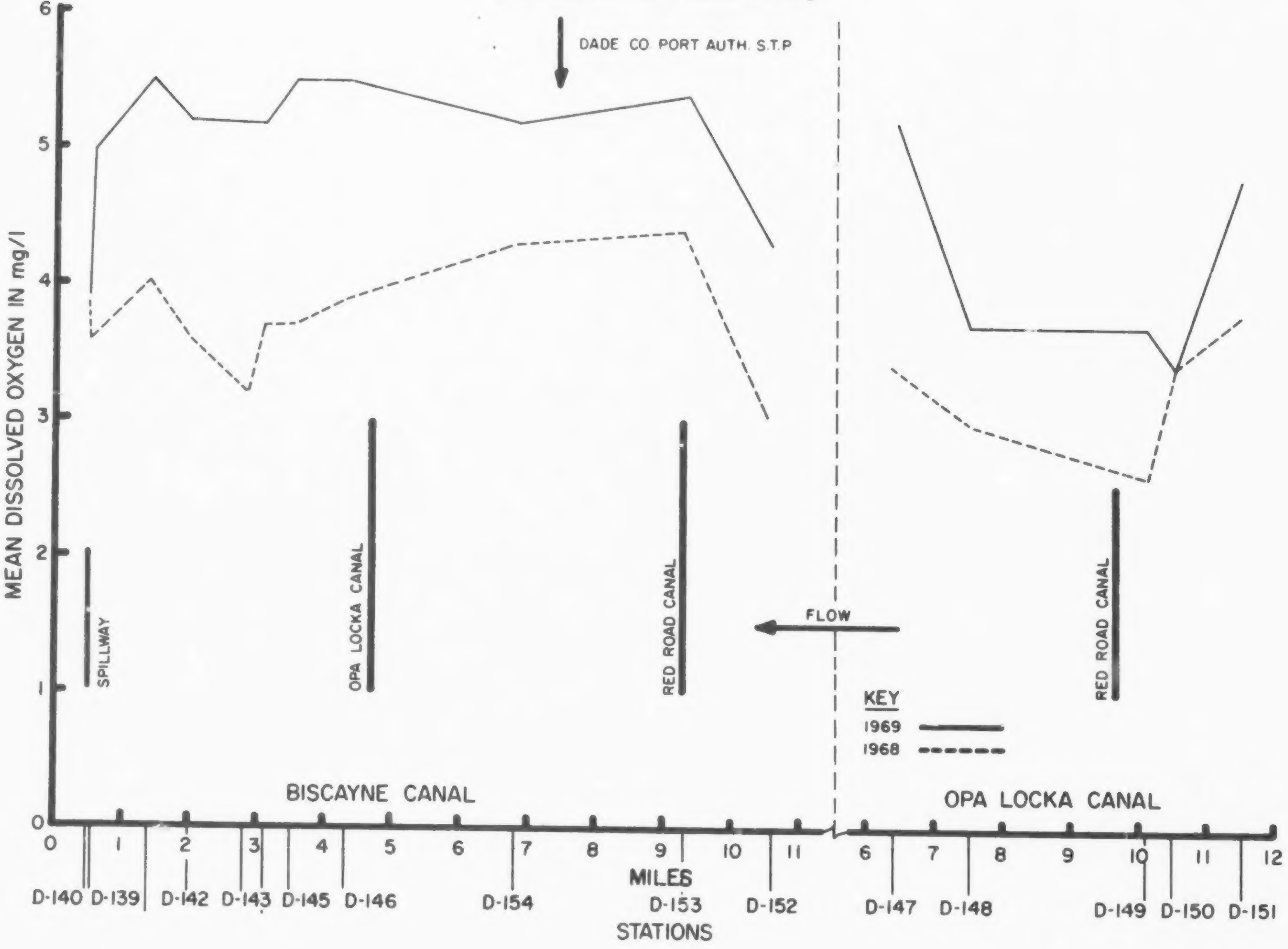
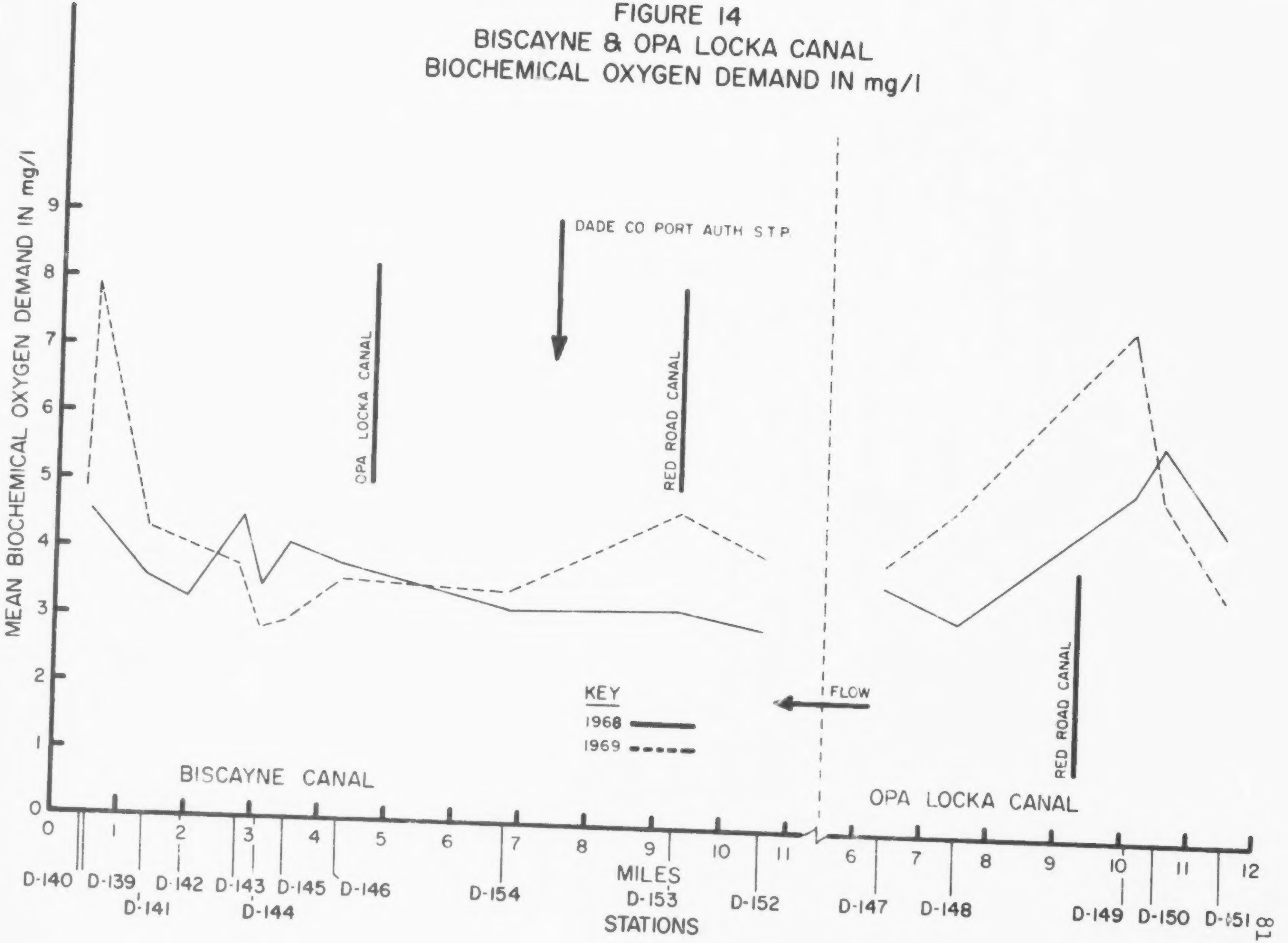


FIGURE 14
BISCAYNE & OPA LOCKA CANAL
BIOCHEMICAL OXYGEN DEMAND IN mg/l



All mean total coliform bacteria densities in both canals violated the standard of 1000 MPN per 100 ml (Figure 15). In general, densities in 1968 were higher than in 1969.

Tamiami Canal

The Tamiami Canal parallels U.S. Highway 41 from the west coast of Florida into Miami where it ultimately discharges into the Miami River. The only documented waste sources entering the canal from mile 12 to the mouth are two sewage treatment plants at the Miami International Airport, which discharge 0.436 and 0.346 mgd respectively.

The mean dissolved oxygen concentrations in the Tamiami Canal at all stations were greater in 1968 than in 1969. The lowest mean D.O. concentrations, ranging from 1.6 mg/l to 0.9 mg/l, occurred between mile 6 and 12. Higher mean concentrations were measured from mile 6 to the mouth, with the greatest mean being 3.7 mg/l, in 1968, at Station D120, mile 2.9. The D.O. profile of the Tamiami Canal violates the 4.0 mg/l standard (Figure 16).

As shown in Figure 17, the mean BOD concentrations in the canal indicate the waters are polluted. Again, the mean BOD values in 1968 were greater than in 1969. The highest mean concentration found was 4.4 mg/l in 1969 at Station D119 just downstream of the two waste discharges.

FIGURE 15
BISCAYNE & OPA LOCKA CANAL
TOTAL COLIFORM M.P.N. PER. 100 ml.

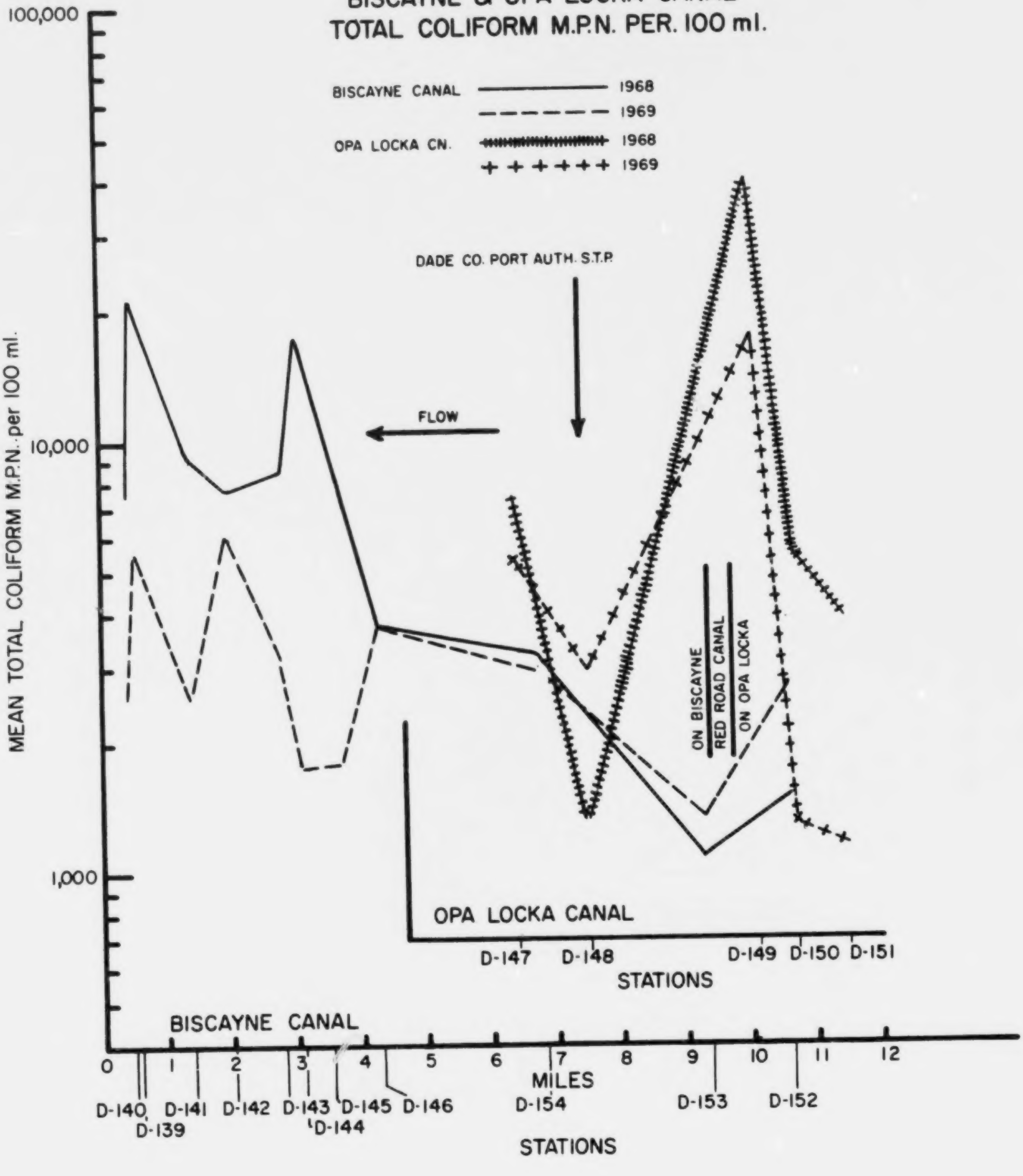


FIGURE 16
TAMIAMI CANAL
DISSOLVED OXYGEN IN mg/l

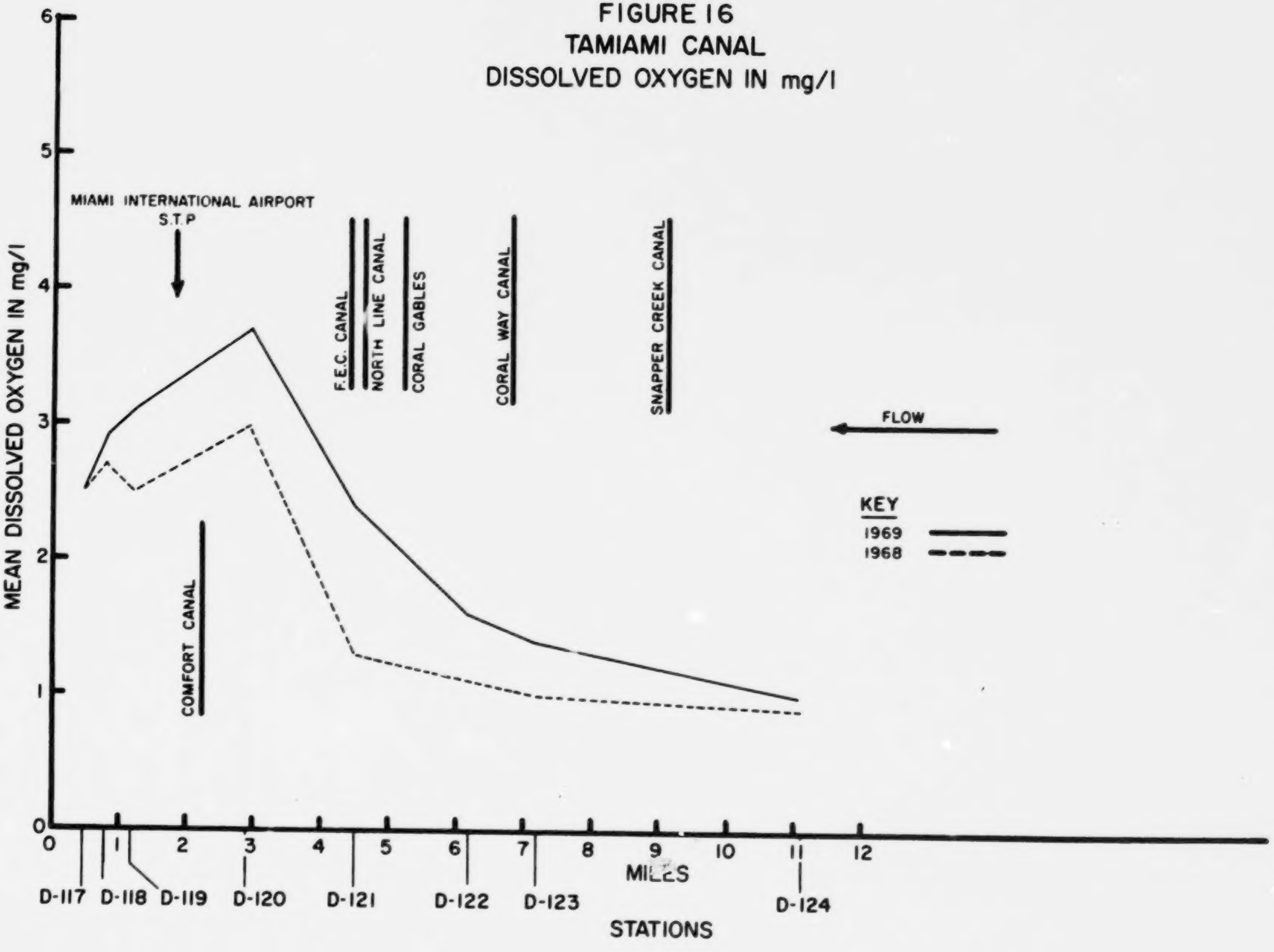
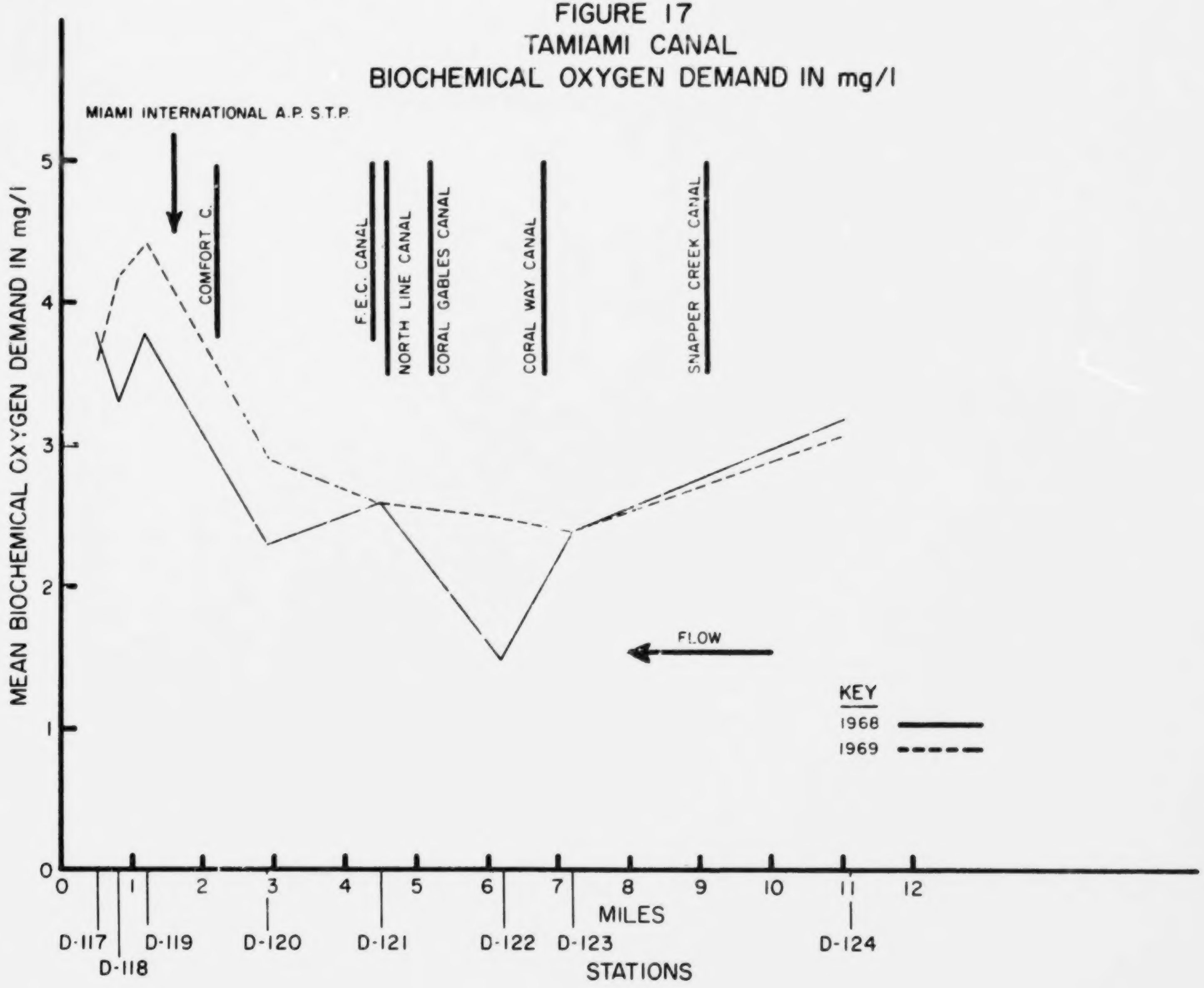


FIGURE 17
TAMIAMI CANAL
BIOCHEMICAL OXYGEN DEMAND IN mg/l



The total coliform bacteria densities were lower in 1969 than in 1968.(Figure 18). In 1969, the mean total coliform density at four of the eight stations sampled violated the 1000 MPN per 100 ml standard. The highest mean density in 1969 occurred downstream of the sewage treatment plants near the mouth of the canal and was 31,000 MPN/100 ml.

Little River Canal

The Little River Canal is approximately 11 miles long and flows from the Miami Canal to Biscayne Bay where it discharges, through two channels, just south of the 79th Street Causeway. A spillway at mile 0.8 regulates flow and prevents saltwater intrusion.

Extremely low mean dissolved oxygen (D.O.) concentrations were observed in the canal as shown in Figure 19. The 1969 mean concentrations were all lower than the 1968 values and ranged from 1.8 mg/l, upstream of the dam, to 0.9 mg/l at mile 6.9. Mean D.O. concentrations throughout the canal violated the 4.0 mg/l standard.

The FWQA study found a mean D.O. concentration of 6.1 mg/l and a mean BOD concentration of 1.6 mg/l at Station 16 near the mouth of the northern discharge channel of the Little River Canal. In the southern discharge channel (Station 17) the mean D.O. was 6.0 mg/l and the mean BOD was 1.2 mg/l. At Station 40, mile 1.7, a mean D.O. of 3.1 mg/l and a mean BOD of 1.8 mg/l were observed (Figure 20).

From mile 6 to mile 11 most 1968 mean total coliform bacteria densities were greater in 1968 than in 1969. (Figure 21). However, from mile 6 to the mouth higher mean bacterial densities were observed in 1969. All mean bacterial densities in the Little River Canal violated the 1000 MPN per 100 ml water quality standard.

FIGURE 18
TAMIAMI CANAL
TOTAL COLIFORM M.P.N. PER. 100 ml.

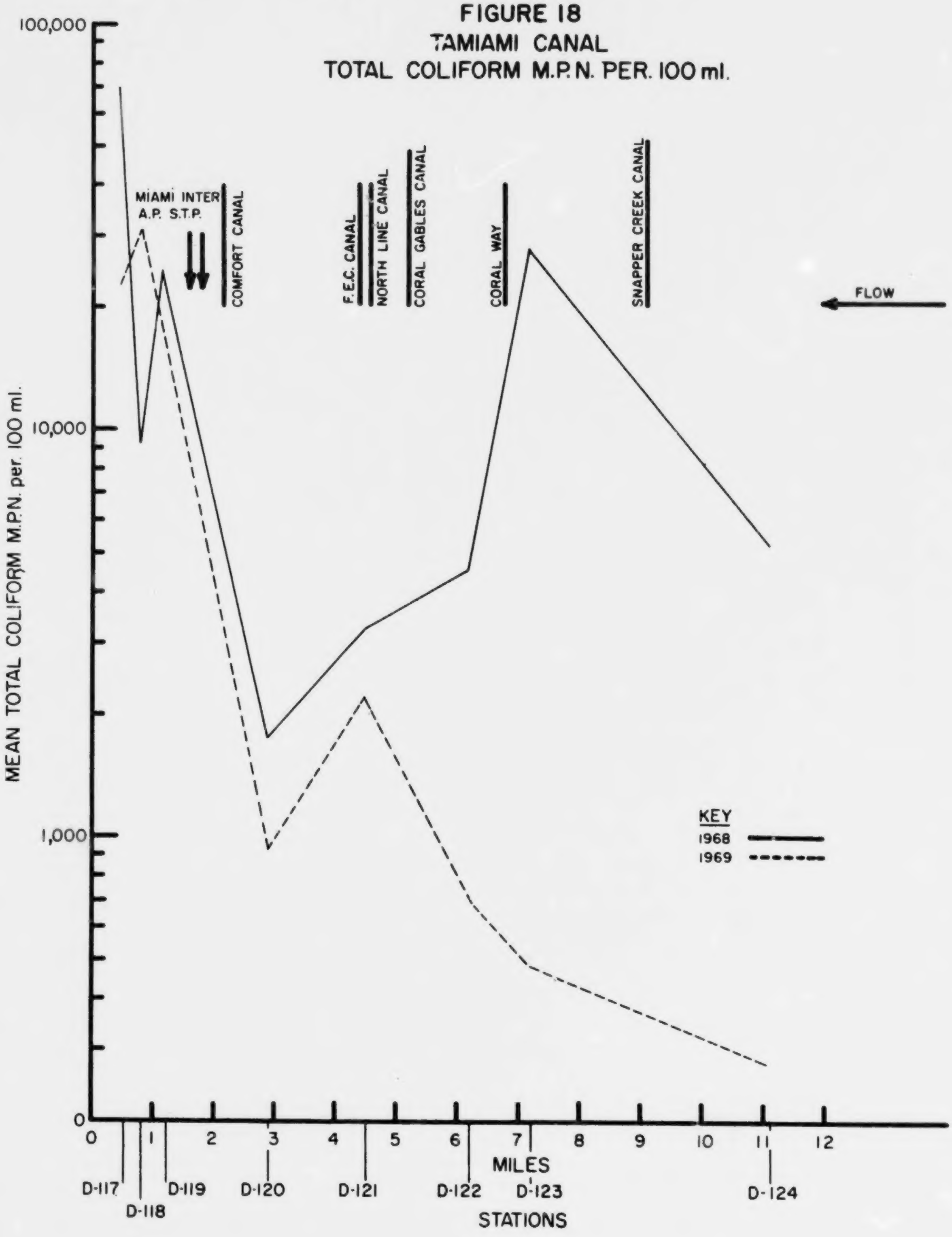


FIGURE 19
LITTLE RIVER CANAL
DISSOLVED OXYGEN IN mg/l

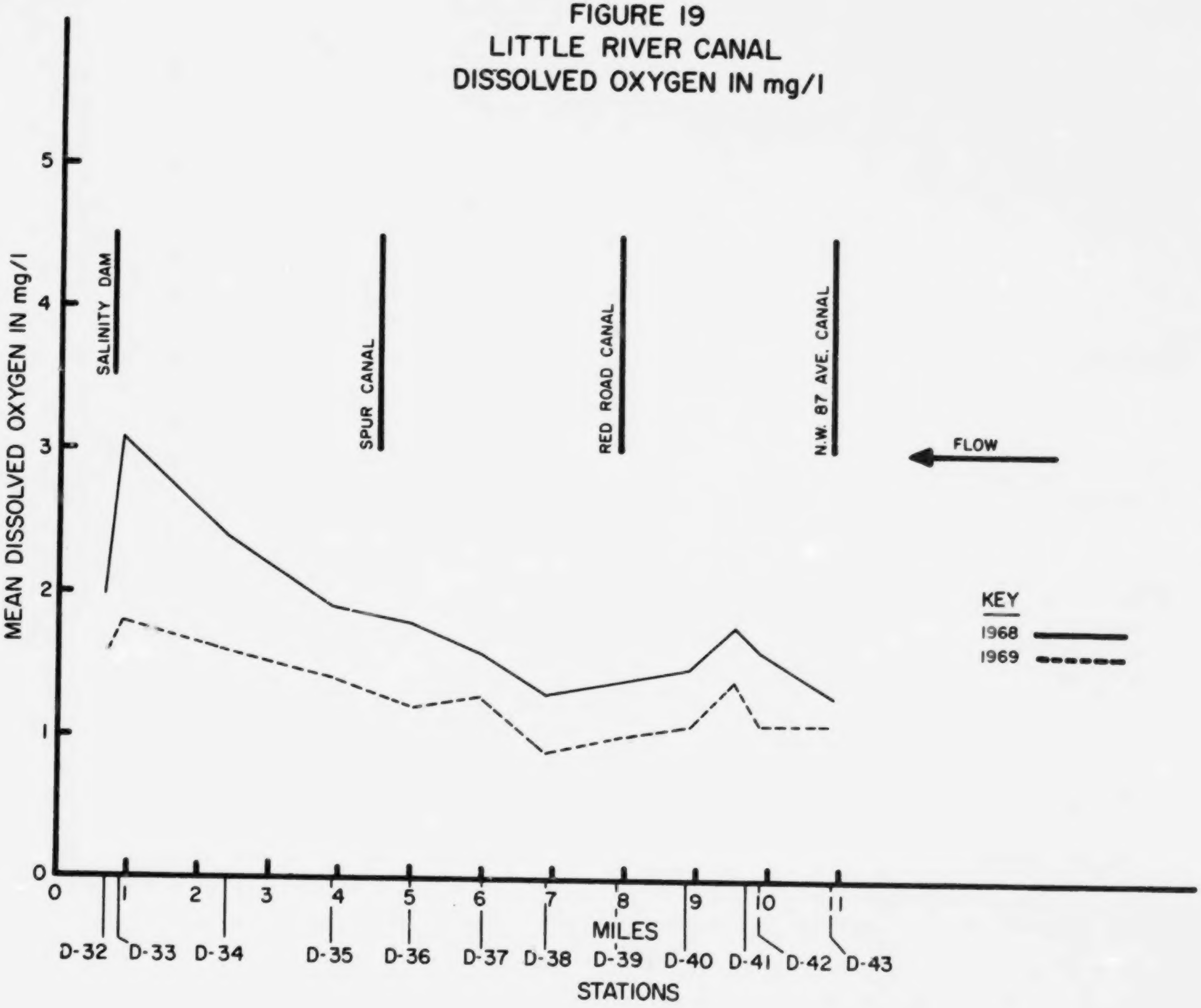


FIGURE 20
LITTLE RIVER CANAL
BIOCHEMICAL OXYGEN DEMAND IN mg/l

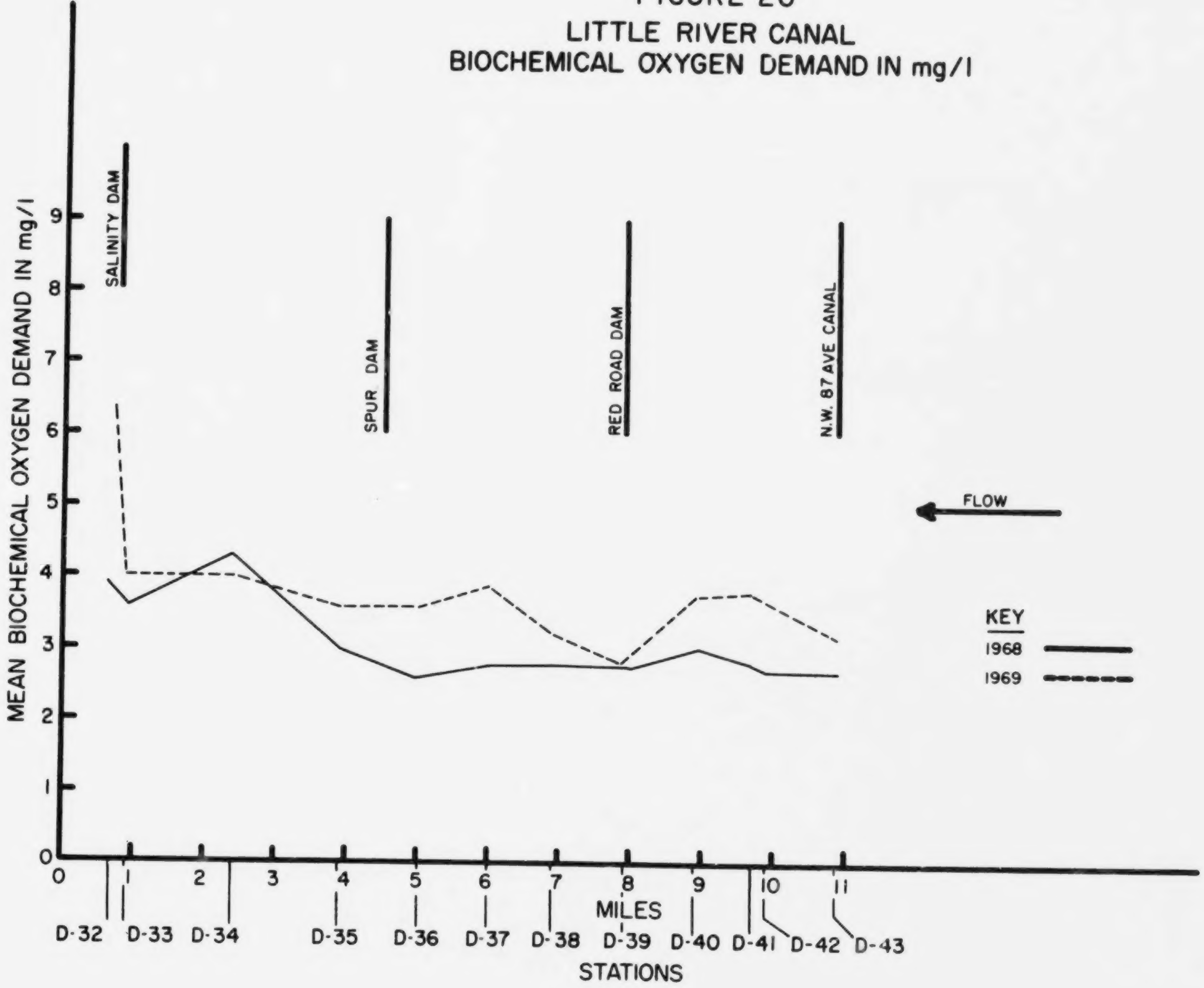
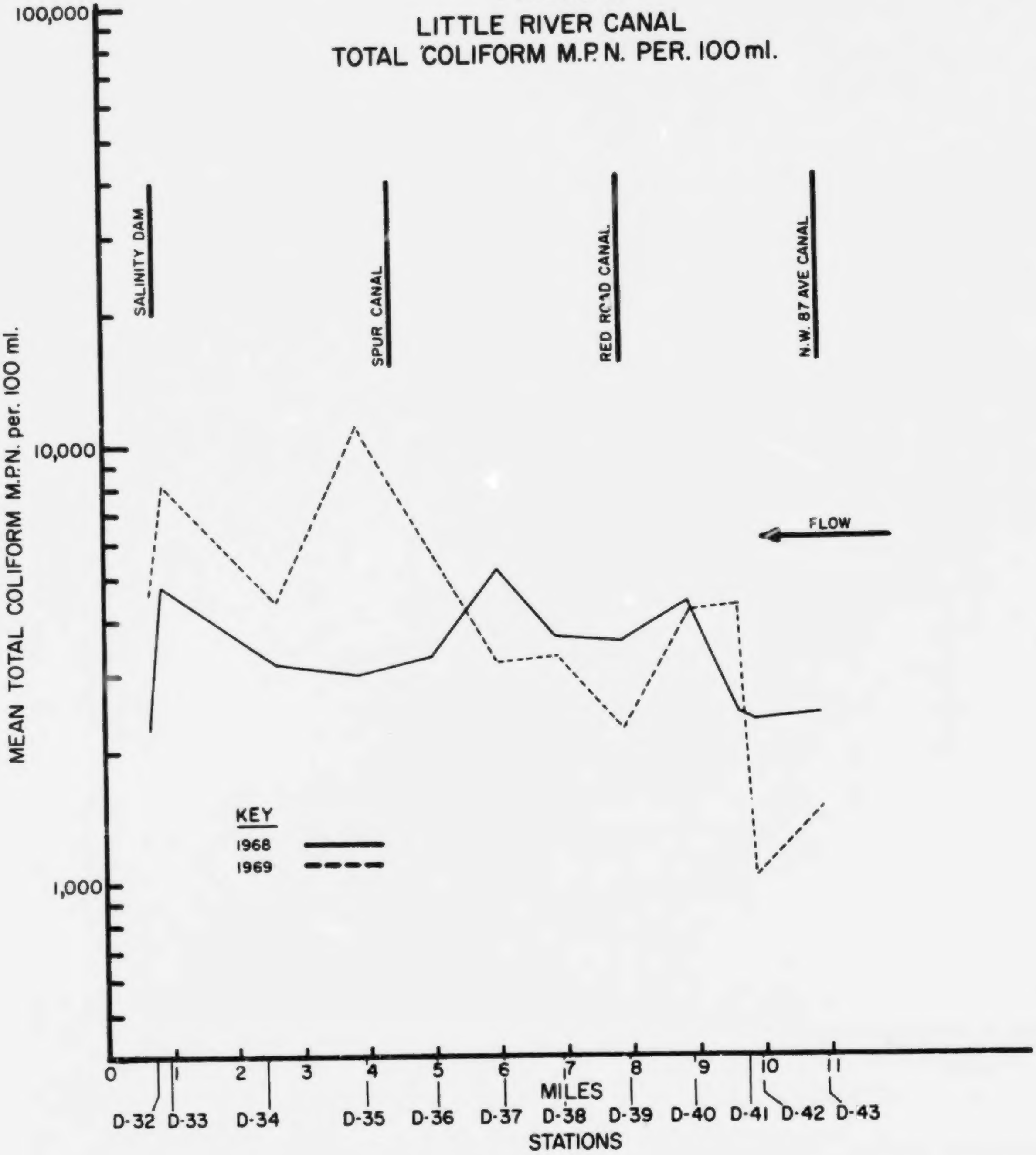


FIGURE 21
LITTLE RIVER CANAL
TOTAL COLIFORM M.P.N. PER. 100 ml.



Snake Creek Canal

Snake Creek Canal extends from Canal C-111 to the Oleta River. The reach from mile 12 to the mouth will be discussed in this section. A spillway is located near the mouth of the canal, and two sewage treatment plants discharge their effluents directly into the canal. The Andover Subdivision S.T.P. discharges 0.673 mgd of waste at mile 4.5 and the Riverdale Estates Subdivision S.T.P. discharges 0.49 mgd at mile 7.3. The Carol City Subdivision and the Myrtle Grove Subdivision sewage treatment plants discharge 2.2 and 2.13 mgd respectively into the Carol City Canal, which enters the Snake Creek Canal at mile 8.

The dissolved oxygen concentrations in the canal were lower in 1969 than in 1968. Mean D.O. concentrations upstream of mile 4 (Figure 22), ranged from 3.1 mg/l in 1968 at Station D160, mile 5.7, to 1.7 mg/l in 1969 at Station D164, mile 7.8. Downstream of mile 4 a high mean concentration of 5.1 mg/l in 1968 was observed at Station D158, mile 2.4, and a low mean of 2.3 mg/l in 1969 was found at this station. In 1968, seven of the eleven sampling stations had mean D.O. concentrations below the 4.0 mg/l standard. In 1969, the mean at one station equalled the standard and it was violated at all other stations.

The biochemical oxygen demand profile of Snake Creek Canal is shown in Figure 23. The 1969 mean concentration was generally greater than the 1968 concentration. The lowest mean values of 1.8 mg/l in 1969 and 2.1 mg/l in 1968 were found at Station D166, mile 8.8. The highest mean concentrations were 6.1 mg/l in 1969 at Station D155, mile 0.1, and 5.7 mg/l in 1968 at Station D157, mile 1.4.

FIGURE 22
SNAKE CREEK
DISSOLVED OXYGEN IN mg/l

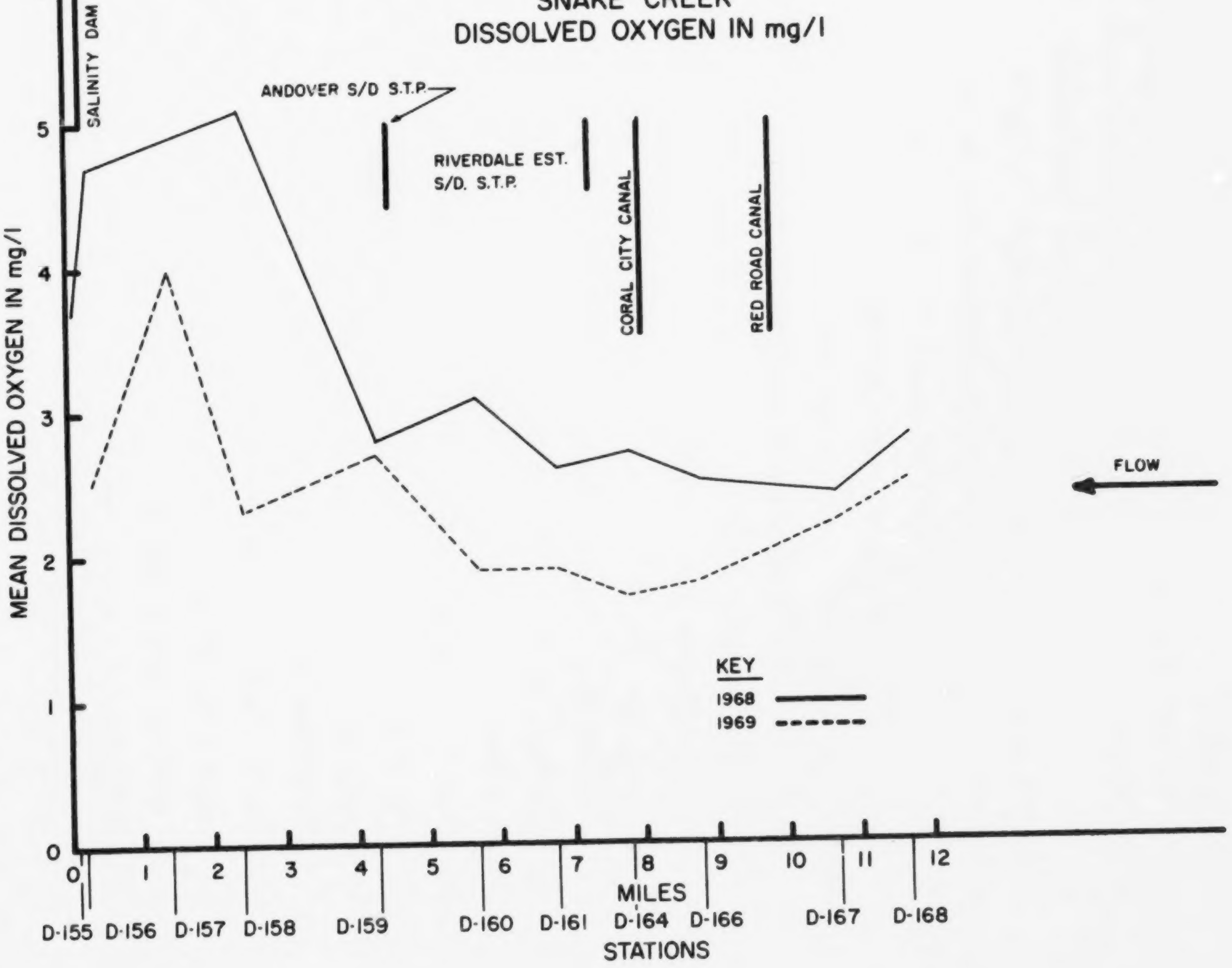
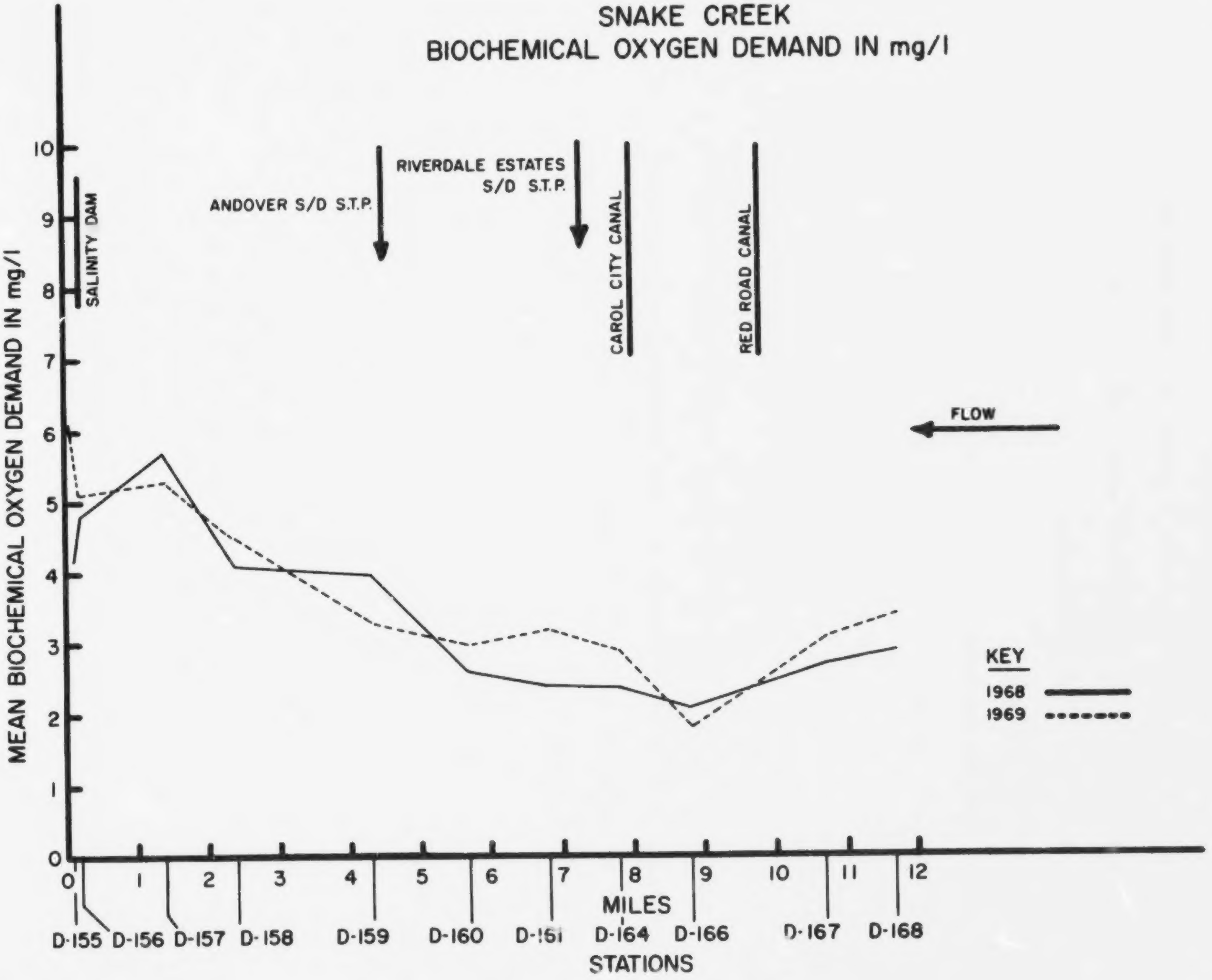


FIGURE 23
SNAKE CREEK
BIOCHEMICAL OXYGEN DEMAND IN mg/l



A mean D.O. of 5.7 mg/l and a mean BOD of 2.1 mg/l were found at Station 21 at the mouth of the Snake Creek Canal during the FWQA study. At Station 43, mile 0.6, a mean D.O. of 6.6 mg/l and BOD of 3.4 mg/l were observed.

Total coliform bacteria densities were greater in 1968 than in 1969 (Figure 24). In 1968, nine of the eleven sampling stations violated the 1000 MPN per 100 ml standard and in 1969, eight stations were in excess of the standard.

Oleta River

The 2.7 mile reach of the Oleta River from the Broward County line to U.S. Highway 1 will be discussed in this section. The Golden Isle Subdivision S.T.P. discharges 0.485 mgd in this reach.

The mean dissolved oxygen concentrations at all stations were lower in 1969 than in 1968, and the biochemical oxygen demand and total coliform concentrations were generally higher in 1969 than in 1968. The effect of the sewage discharge is in evidence downstream of the sewage treatment plant. The D.O. concentration drops and the BOD and total coliform concentrations rise (Figures 25, 26, and 27).

During the FWQA study, the mean D.O. concentration was 4.7 mg/l and the mean BOD concentration was 1.7 mg/l at Station 44, mile 0.7.

FIGURE 24
SNAKE CREEK
TOTAL COLIFORM M.P.N. PER 100 ml.

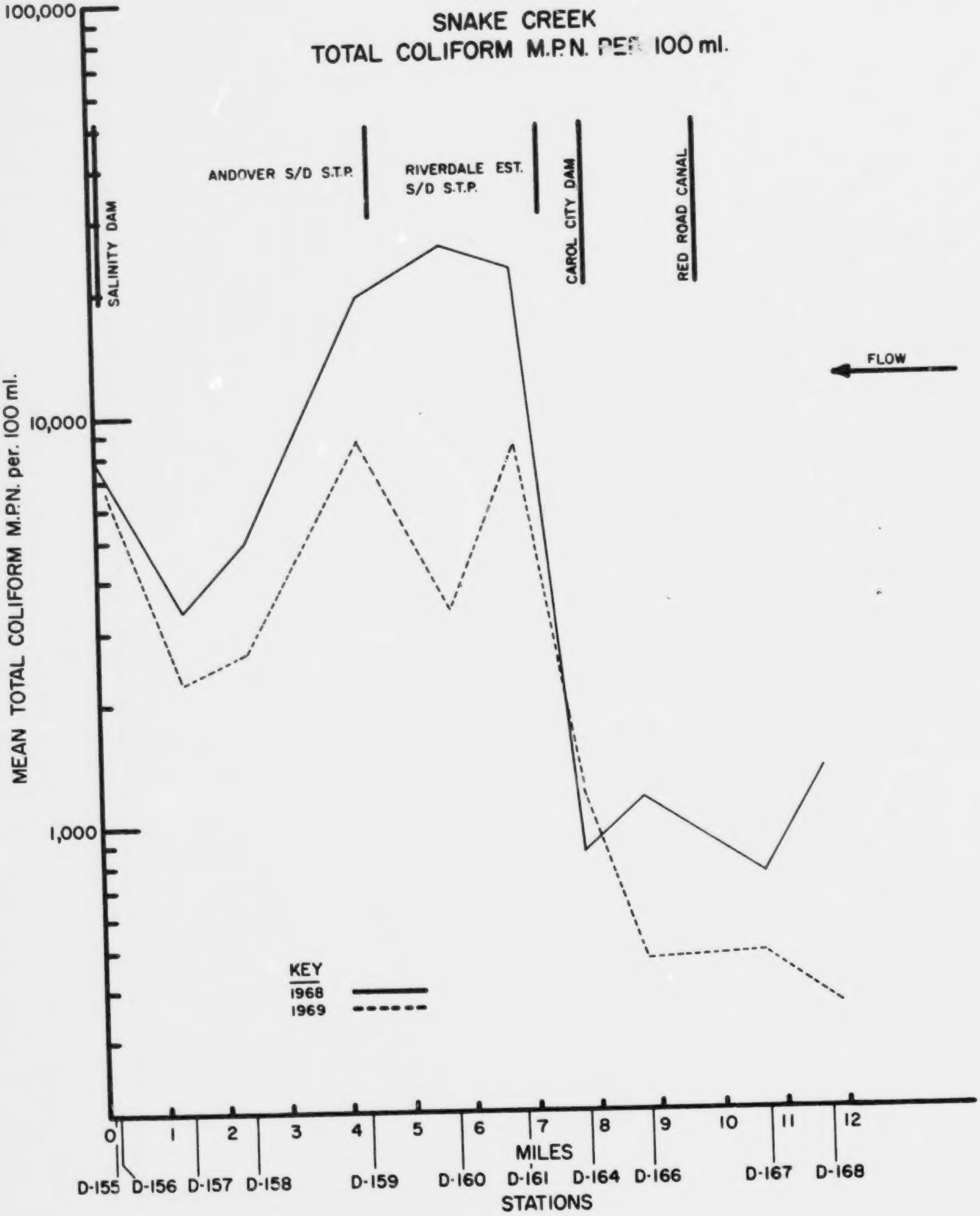


FIGURE 25
OLETA RIVER
DISSOLVED OXYGEN IN mg/l

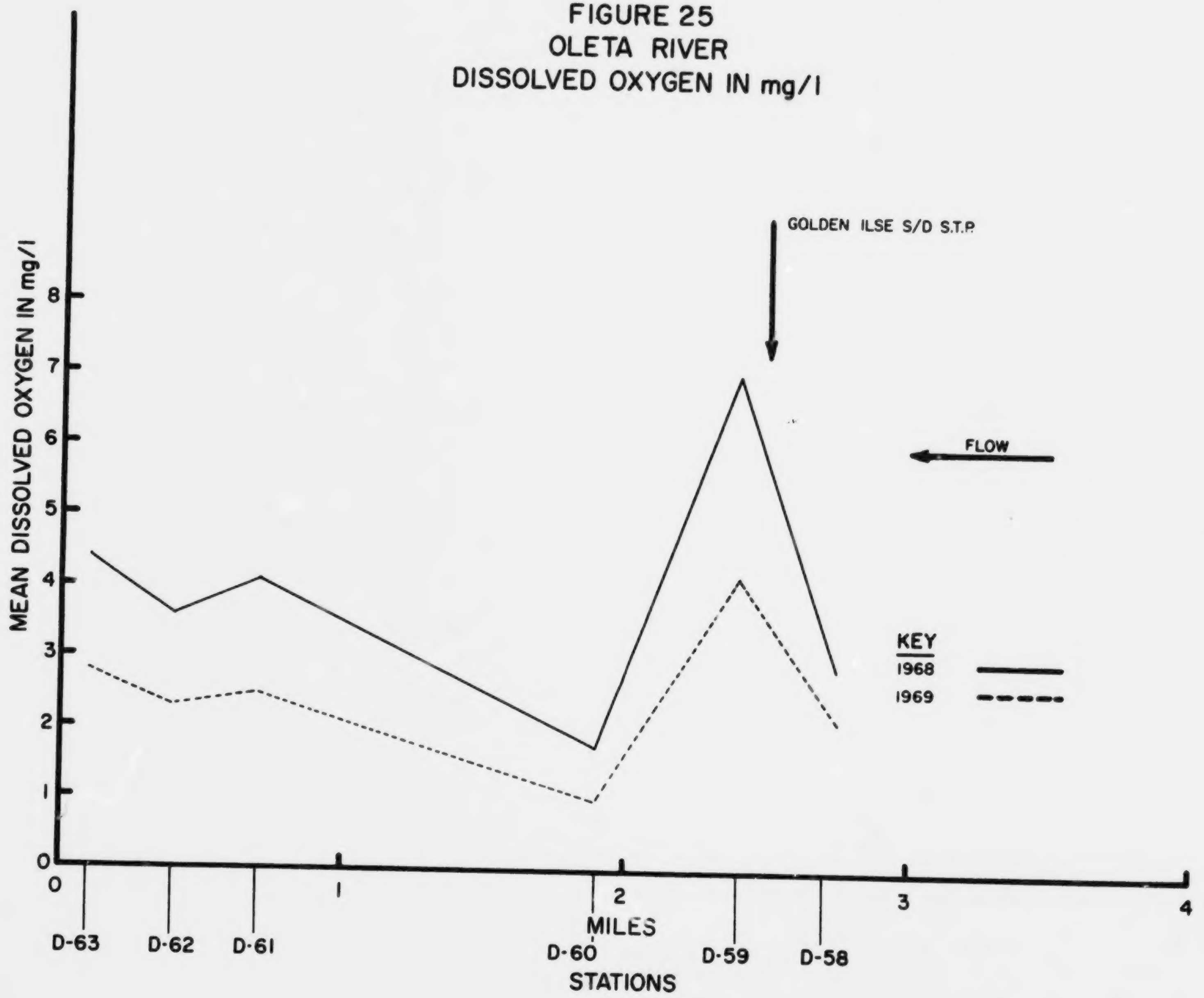


FIGURE 26
OLETA RIVER
BIOCHEMICAL OXYGEN DEMAND IN mg/l

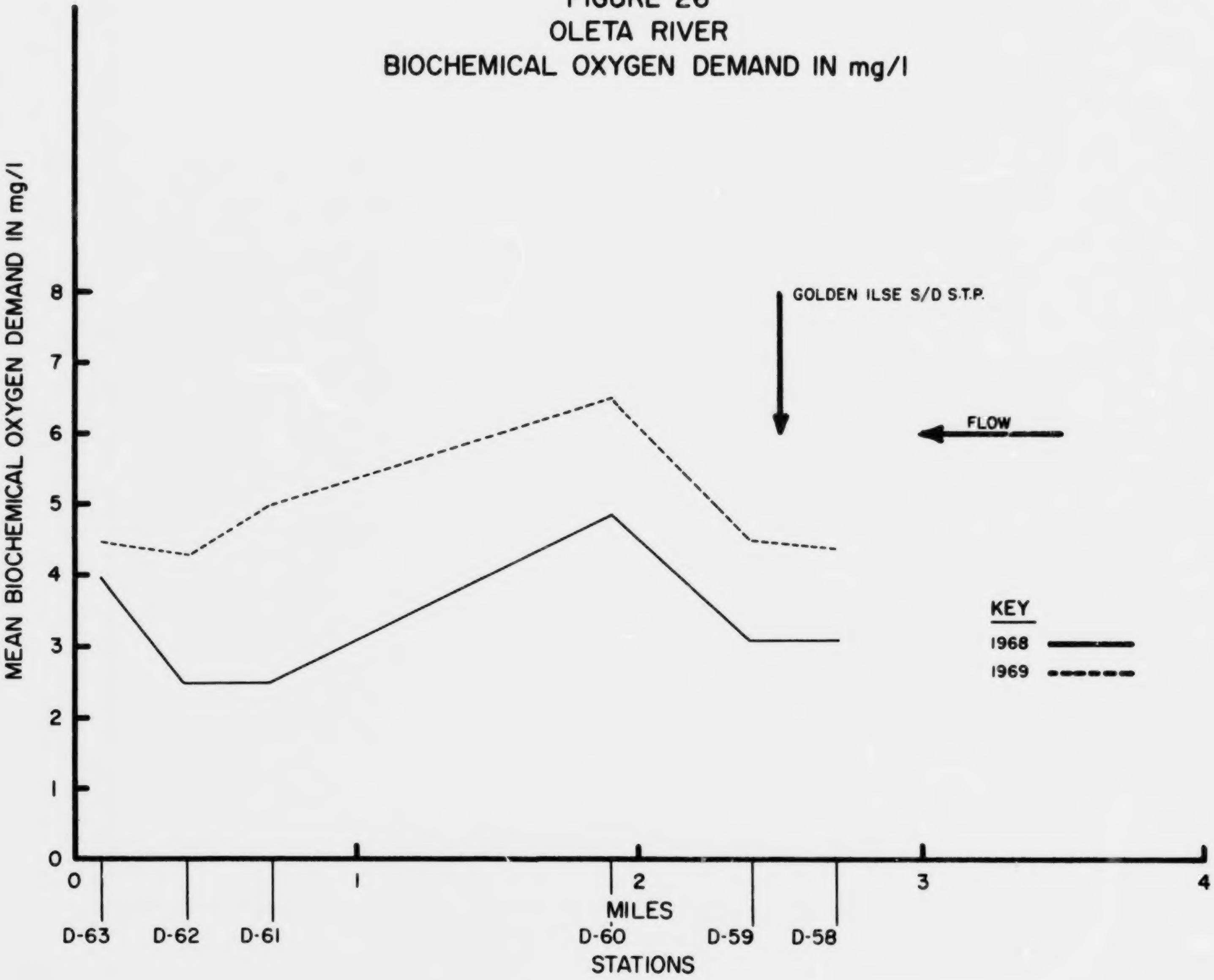


FIGURE 26
OLETA RIVER
BIOCHEMICAL OXYGEN DEMAND IN mg/l

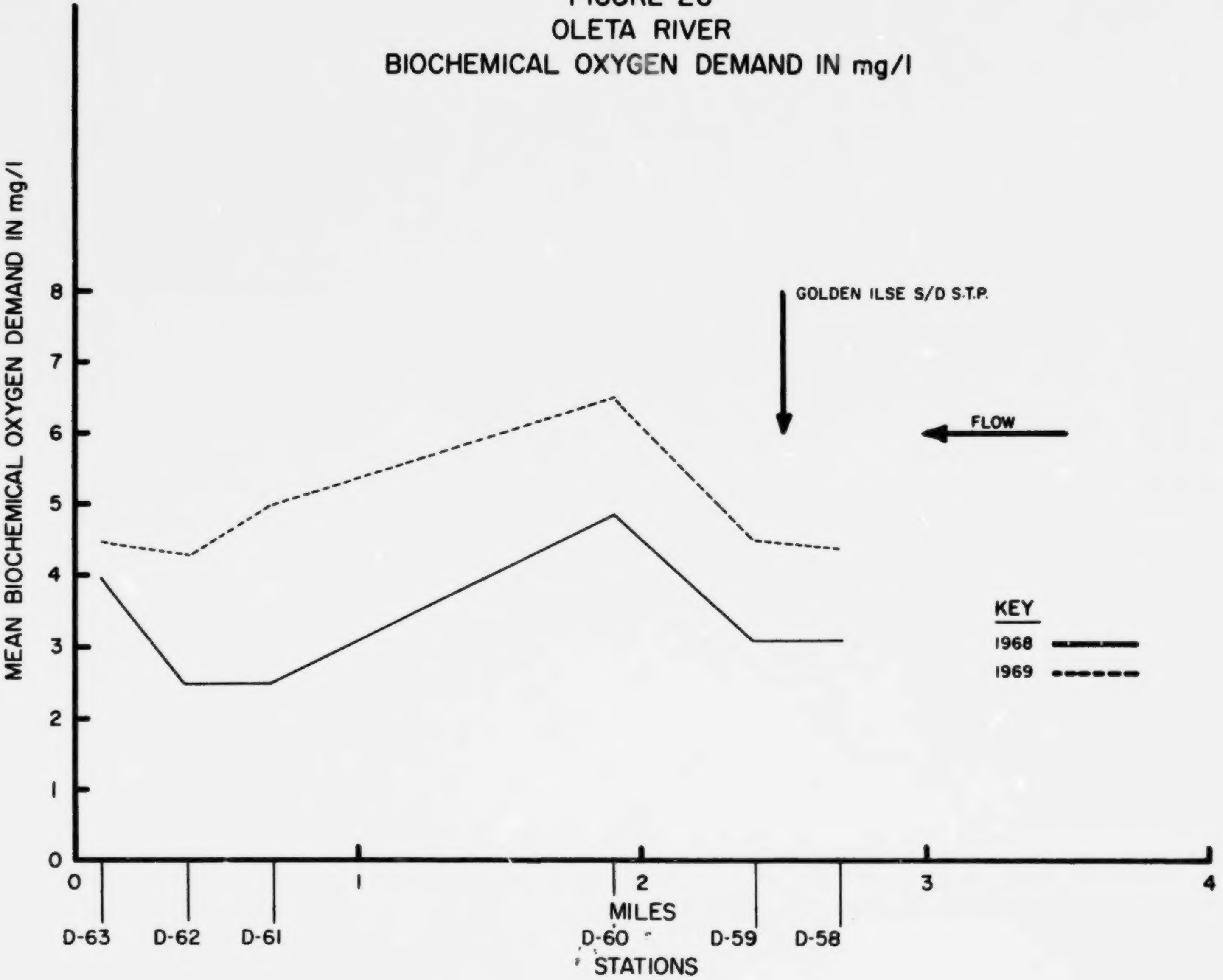
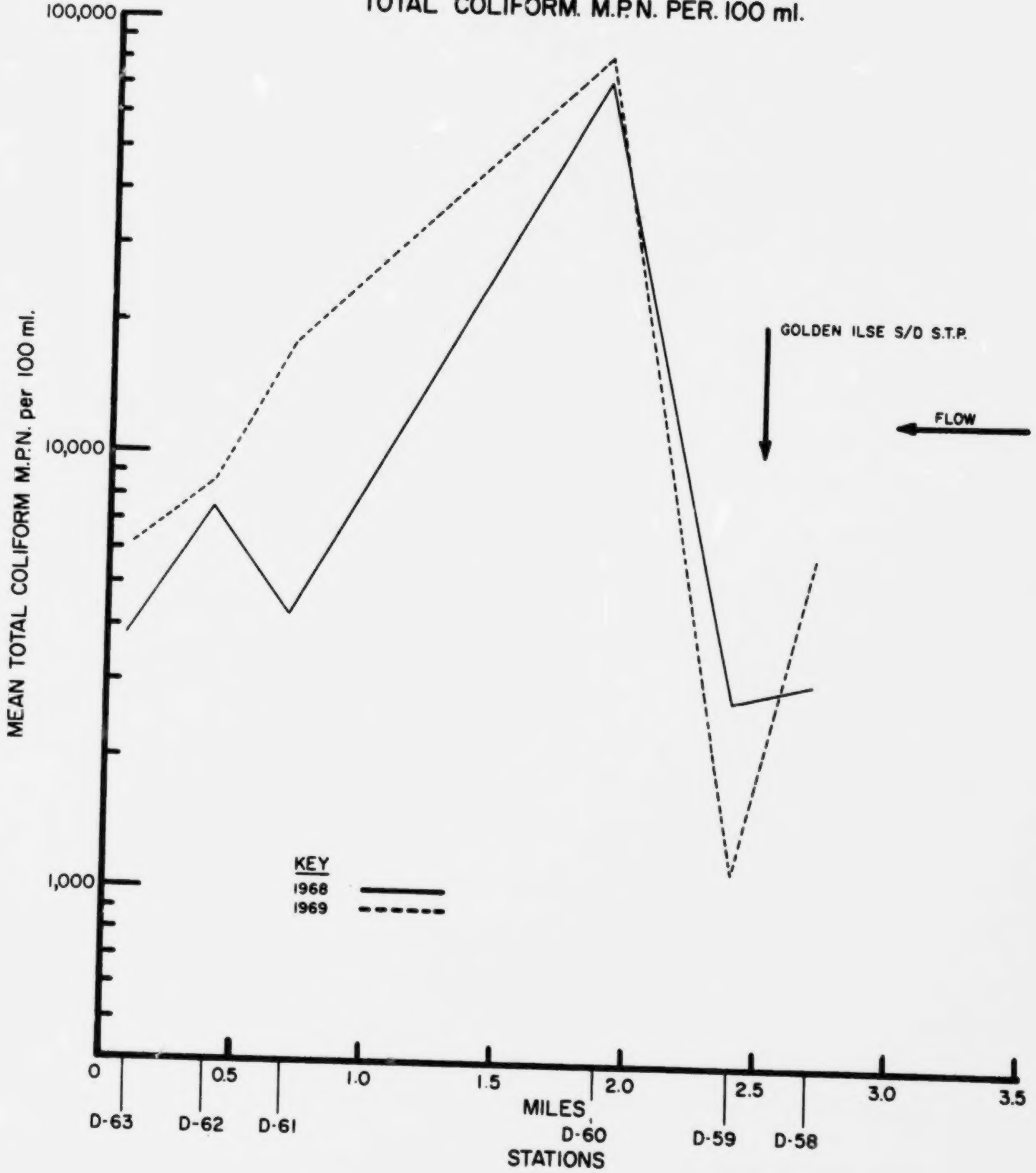


FIGURE 27
OLETA RIVER
TOTAL COLIFORM. M.P.N. PER. 100 ml.



SOUTHERN DADE COUNTY CANALS

The major canals in Southern Dade County are in the Lower Biscayne Bay drainage and include C-100, Black Creek, C-102, C-103 (Mowry Canal), Military Canal, and Florida City Canal. Water quality in these canals is relatively better than in the north Dade County canals. Drainage basins are less densely populated and, in the extreme southern end of the county, land use is principally agricultural.

Black Creek receives treated sewage effluent from two private utility company plants, South Miami Heights and South Coral Homes. A new plant serving the Goulds-Perrine area will also discharge into Black Creek near Hamlin Mill Drive. Black Creek discharges directly into the Biscayne National Monument near its northern boundary. Dissolved oxygen at Station D-66, Old Cutler Road, averaged 4.3 mg/l in 1968 and 2.5 mg/l in 1969. BOD increased from 3.3 mg/l in 1968 to 4.7 mg/l in 1969. Coliform bacteria densities averaged 32,950 MPN/100 ml and 56,141 MPN/100 ml in 1968 and 1969 respectively. These coliform concentrations are in violation of the established standard as are the 1969 D.O. concentrations.

FWQA data from 10 samples at Station D-66 indicate very high nutrient levels: 1.12 mg/l phosphate as P, 2.19 mg/l total Kjeldahl Nitrogen as N, 1.40 mg/l of Ammonia as N, and 0.26 mg/l of Nitrate as N. These levels of nutrients, particularly ammonia and nitrate, are indicative of a highly putrescible organic waste such as sewage.

Below the salinity barrier at levee L-31E in the tidal portion of Black Creek Canal the D.O. averaged 4.3 mg/l in 1968 and 3.1 mg/l in 1969.

Coliform bacteria concentrations were also higher in 1969 than 1968 with values of 23,111 MPN/100 ml and 5583 MPN/100 ml respectively.

Goulds Canal is a short straight ditch along Coconut Palm Drive from about 120th Avenue to the Bay. It has no known direct sewage discharges. However, D.O. at Station D-44 shows a substantial decrease from 5.4 mg/l in 1968 to 2.6 mg/l in 1969. FWQA data indicate an unusually high nitrate concentration of 3.28 mg/l while all other nutrients, including phosphate and ammonia are very low. This is indicative of a highly nitrified discharge reaching the waterway perhaps through subsurface seepage.

FWQA data from 9 samples on C-102 (Moody Canal) show high nitrates (1.56 mg/l as N) with acceptable levels of all other constituents, again indicating possible subsurface seepage.

Military Canal has been subject to several fish kills in recent years. Improperly treated sewage effluent from Homestead Air Force Base, with at least one instance of raw sewage bypassed directly to the canal, has been blamed for these kills. At Station D-46 (S. W. 107th Avenue), D.O. averaged 5.1 mg/l in 1968 and 1.8 mg/l in 1969. Occasions of zero D.O. were observed. Twelve samples by FWQA shows an average BOD of 15.1 mg/l, 2.5 mg/l total phosphate as P, 4.18 mg/l total kjeldahl nitrogen as N and 2.91 mg/l Ammonia as N. All of these concentrations are indicative of severely polluted conditions and the 1969 D.O. concentrations are in violation of Federal, State and local standards. Concentrations at the mouth of the Canal, after dilution in the tidal water of Biscayne Bay were: 4.2 mg/l of BOD, 0.4 mg/l of total phosphate as P and 0.41 mg/l of Ammonia as N. Military Canal discharges directly into the Biscayne National Monument.

Mowry Canal (C-103) is well covered by the Dade County monitoring program although many of the stations have only one year (1969) of data available at this time. Dissolved oxygen levels are quite low, ranging from 2.0 mg/l to 4.3 mg/l. BOD levels are correspondingly high, ranging up to 20 mg/l. North Canal, which connects to Mowry Canal to form a combined discharge, receives sewage effluent from the City of Homestead plant. Dade County's data show D.O. averages about 3.0 mg/l and BOD averages above 4.0 mg/l in that reach of the canal. Coliform bacteria densities averaged 6,123 MPN/100 ml at Station D-51 in 1969, down markedly from the average of 1,336,000 MPN/100 ml reported for 1968. The combined flow of Mowry and North Canal flows into the Biscayne National Monument some two miles north of Turkey Point. Both D.O. and coliform levels are in violations of Federal, State and local standards.

Finally, Florida City Canal originates at U.S. Highway 1 and flows eastward to Biscayne Bay. Four sampling stations on this canal indicate that D.O. averaged less than 2.6 mg/l in 1969 and that it was lower in 1969 than in 1968. There are no known sewage effluents discharging into Florida City Canal.

UPPER AND MIDDLE BISCAYNE BAY

There is very little water quality data available for upper Biscayne Bay and no data available for the middle bay. Water quality data from the upper bay were collected by FWQA during February through May 1969. One to ten samples were collected at each station.

At Station 12, near the Venetian Causeway, the mean D.O. concentration was 8.4 mg/l and the mean BOD was 1.9 mg/l. In Government Cut the mean D.O. was 7.1 mg/l and the mean BOD was 1.3 mg/l near the inlet. Near the Miami end of the cut, the D.O. averaged 7.6 mg/l and the average BOD was 2.0 mg/l. At the Rickenbacker Causeway an average D.O. of 7.4 mg/l and a mean BOD of 2.0 mg/l were observed. Between Virginia Key and Key Biscayne the mean D.O. was 7.4 mg/l and the mean BOD was 1.7 mg/l.

Water quality data in the Intracoastal Waterway north of Biscayne Bay were also collected by FWQA. A mean D.O. of 7.1 mg/l and a mean BOD of 2.2 mg/l were observed at Station 22 which is in the Intracoastal Waterway just south of the Sunny Isle complex. At Station 20 in the Intracoastal Waterway at Golden Beach the mean D.O. was 5.9 mg/l and the mean BOD was 1.4 mg/l.

The quantity and scope of the data presently available for upper Biscayne Bay will not allow any conclusions regarding water quality.

LOWER BISCAYNE BAY

Lower Biscayne Bay has been the object of extensive study by FWQA and other agencies for the past several years. Data from all known sources indicate that with respect to the chemical and bacteriological parameters normally associated with sewage or organic pollution the open water of lower Biscayne Bay is of extremely high quality.(12)(13)

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(12) "Report on Thermal Pollution of Intrastate Waters Biscayne Bay, Florida, FWQA, February 1970.

(13) Roessler, M. A., Tabb, D. C. and Bader, R. G., "An Ecological Study of South Biscayne Bay in the Vicinity of Turkey Point", January 1970.

The significant pollution problem of the lower Bay is that of thermal discharges which were considered at an enforcement conference in February of 1970.

ATLANTIC OCEAN

The only water quality data available for the Atlantic Ocean were collected by the Dade County Health Department as part of its routine bacterial surveillance program of Miami Beach, and by the Dade County Pollution Control Department during a study of the Miami Beach ocean outfall.

Raw sewage is discharged into the Atlantic Ocean at two locations in Dade County. Seventeen million gallons per day (mgd) of raw waste from Miami Beach are discharged at 74th Street through a 36-inch outfall which extends 6,000 feet into the Atlantic Ocean. A second outfall at 163rd Street discharges about 11 mgd through a 48-inch pipe which extends 11,000 feet into the ocean. Secondary effluent from the City of Miami Sewage Treatment Plant at Virginia Key is also discharged to the ocean through an outfall. This outfall is 70 inches in diameter and extends 4,600 feet in the ocean. The quantity of waste discharged is 47 mgd.(14)

Samples for total coliform analysis were collected from the surf on a monthly basis at 20 sampling stations from Miami Beach Pier in the south to Golden Beach in the north. The highest median total coliform bacteria density observed in 1968 was 48 MPN/100 ml at 96th Street. The median densities in 1969 were all lower than those for 1968, with a high median value of 8.5 MPN/100 ml occurring at Haulover Pier. In 1969, the months of January and February had higher bacterial densities than the other months.

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(14) Letter dated July 23, 1970, Paul Leach to Vincent Patton.

The maximum density in January was 920 MPN per 100 ml at 31st Street. No densities quite as high were observed in February and the median density for the entire surveillance area was 79 MPN per 100 ml during both months. During 1968, the highest coliform bacteria densities were observed in August. Values of 1600 MPN per 100 ml were found at 88th Street, Haulover Pier, and Golden Beach. In February of that year a total coliform density of 2300 MPN per 100 ml was observed at Miami Beach Pier.

On July 28, 1968, a special study of the effluent point of the Miami Beach ocean outfall was performed by Dade County Pollution Control.(15) Total coliform bacteria densities at the four boils, 6,900 feet from the shore, ranged from 5,400,000 to 54,000 MPN per 100 ml at the surface. Four hundred and fifty feet north of the outfall line surface concentrations ranging from 3,500,000 to 330,000 MPN per 100 ml were observed, and at the same distance south of the outfall the range of concentrations was 1,700,000 to 79,000 MPN. Bottom samples collected during the study were significantly lower, ranging from 4900 to 130 MPN per 100 ml. Additional data, collected on July 13, 1970, indicated the fecal coliform bacteria densities at the 74th Street pumping station were 16,000,000 MPN per 100 ml.

Dissolved oxygen concentration in the vicinity of the effluent plume varied from 4.0 to 6.4 mg/l and no difference between surface and bottom concentrations was observed. The biochemical oxygen demand values varied from 5.8 to 1.2 mg/l at the surface, 2.4 to 0.8 mg/l at the bottom, and 4.0 to 1.2 mg/l at 10 feet below the surface.

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(15) Metropolitan Dade County Pollution Control, Special Water Pollution Control Survey, Effluent Point of Miami Beach Outfall, July 28, 1970.

There is generally paucity of data for the Atlantic Ocean off the coast of Lower Florida. No information was available with regard to water quality in the vicinity of the North Miami and Virginia Key outfalls. Additional information pertaining to the effects of outfalls on the water quality and the biota of the open ocean receiving waters is needed.

SUMMARY AND DISCUSSION

Water quality data presented herein for the Coral Gables Waterway, Miami River, Snapper Creek Canal, Biscayne and Opa Locka Canals, Tamiami Canal, Little River Canal, and Snake Creek Canal, indicate that the inland waters of northern Dade County are grossly polluted.

Dissolved oxygen concentrations of less that 4.0 mg/l were found in all canals most of the time during 1968 and 1969.

Biochemical oxygen demand generally varied inversely as D.O. indicating that the decreased D.O. is due to the decay of organic material rather than any naturally occurring phenomenon.

Coliform bacteria densities exceeded the 1000 MPN per 100 ml standard in every canal during 1968 and 1969. These bacteria are indicative of sewage discharges.

Decreased D.O. and increased BOD concentrations and coliform bacteria densities correspond to known sources of municipal waste and further implicate these sources as the principal cause of deteriorated water quality.

The canals of southern Dade County which discharge into the Biscayne National Monument exhibit some water quality degradation from sewage effluent although they are not as grossly polluted as the canals in the northern population center of the county. Several instances have been noted in Black Creek and Military Canal in which water quality criteria are being violated. Also noted in most of the waters are high levels of nutrients, especially ammonia and nitrates and coliforms which may be indicative of subsurface seepage of septic tanks and agricultural runoff.

Insufficient data are available to draw conclusions regarding water quality in Upper and Middle Biscayne Bay. Data reported elsewhere show Lower Biscayne Bay to be almost completely free of sewage or organic pollution based on its extremely high chemical and bacteriological water quality.

Very limited data on the open waters of the Atlantic Ocean show bacteriologically degraded conditions in the immediate vicinity of the municipal ocean outfalls. Coliform levels reported at inshore areas were generally below the established standard of 1000 mpn/100 ml with several exceptions.

The ground, surface, estuarine and ocean waters in Dade County are interrelated. The canals recharge groundwater and receive water from the ground during dry periods, and they also discharge into Biscayne Bay while water from the Bay is exchanged with ocean water and vice versa. Therefore, if the water quality of the canals is allowed to deteriorate further, especially in the northern portion of the County, or even remain the same, serious problems will occur throughout the water system. One potential problem is pollution of the groundwater, which is the water supply for Dade County. The Hialeah-Miami Springs well field is located within 3000 feet of the acutely polluted Miami Canal and the southwest Dade well field is within a mile of the Snapper Creek Canal. Groundwater levels in the well field areas are highly dependent upon recharge from these canals. Eventually ground water in this area may become so polluted that it cannot be used as a safe water supply even after conventional treatment.

Another problem could occur if water from the canals is backpumped into the conservation areas. Such a proposal is being considered by the U.S. Army Corps of Engineers and the Central and Southern Florida Flood Control District. At present there is no information readily available regarding the condition of the regions that could receive the backpumped canal water. This information, together with the operation plan for the flow regulating devices on the canals, must be known and made available before their effects on water quality can be determined.

The establishment of the Biscayne National Monument in Lower Biscayne Bay will require the continued preservation of the existing high quality of its waters. Present and especially future waste discharges to the Lower Bay and its tributaries must be strictly controlled. To this end, consideration should be given to complete removal of all waste effluents from this area.

The question of ocean outfalls has not been adequately investigated to allow for definite conclusions on their effects. The long-term effects in both estuarine and open waters has not been adequately measured although available data indicate these effects may be minimal. However, little if any consideration has been given to the effect of discharging these large amounts of fresh water to the ocean on the continued availability of fresh water in Dade County. With the projected population growth of the area to 2.7 million people, consideration must be given to not only protecting the water quality but also reclaiming this water to assure a continued adequate supply.

Finally, a regional water quality management plan for the entire south Florida population corridor is needed. Such a plan would include considerations of advanced waste treatment, groundwater recharge, ocean outfalls, reclamation of water for recycling to the water conservation areas, control of discharge of fresh water to the ocean, and the effects of future developments in up-state areas on the water quality and supply in Southeast Florida.

APPENDICES

APPENDIX A-1

SAMPLING STATIONS

Dade County

Dade County Pollution Control Authority

STATION	CANAL	LOCATION
D1	C-100C	N. Kendall Drive
D2		Killian Dr. and SW 112th St.
D3		US #1
D4		Casa Granada - Downstream
D5	C-100A	US #1
D6		Chapman Field Dr. - SW 124th St.
D7		Coral Reef Dr. - SW 152nd St.
D8		Richmond Dr. - SW 168th St.
D9	C-100	Richmond Dr.
D10		US #1
D11		SW 117th Ave.
D12	C-100B (Bel-Aire Canal)	Eureka Dr.
D13		SW 97th Ave.
D14		Marlin Dr.
D15	C-103	E. side Salinity Dam
D16		W. side Salinity Dam
D17		Allapattah and SW 318th St.
D18		6-Mile Rd. - SW 117th Ave. and 318th St.
D19		Downstream - NE 5th St.
D20		Upstream - NE 5th St.
D21	Red Road Canal	NW 57th Ave. and 202nd St.
D22		NW 167th St.
D23		NW 142nd St.
D24		W 68th St.
D25		W 56th St.
D26		W 49th St.
D27		W 37th St.
D28		W 23rd St.
D29		W 16th St.
D30		W 16th Ct. and 68th St.
D31		W 17th Ave. and 68th St.
D32	Little River Canal	NE 79th St. Bridge - S. of Dam
D33		NE 83rd Ct. - N of Dam
D34		NW 7th Ave.
D35		NW 17th Ave. and 103rd St.
D36		NW 27th Ave. and 106th St.
D37		E 11th Ave. and 52nd St. Hia.-Seaboard
D38		E 4th Ave. and 52nd St., Hia.-Famingo Way
D39		Red Road - W. 4th Ave., Hialeah
D40		W 12th Ave., Hialeah
D41		Burdines-Downstream
D42		Palmetto Bypass
D43		Everglades Fire Station

APPENDIX A-1 (Continued)

SAMPLING STATIONS

STATION	CANAL	LOCATION
D44	Goulds Canal	Allapattah Rd.
D45		SW 97th Ave.
D46	Military Canal	SW 107th Ave.
D47		Homestead AFB
D48	North Canal	Flood Control Dam
D49		6-Mile Rd.
D50		Tallahassee Rd., 137th Ave.
D51		SW 162nd Ave.
D52		Feeder Canal - South of 162nd Ave.
D53		City of Homestead STP Driveway
D54	Florida City Canal	US #1
D55		Stone Bridge
D56		Tallahassee Rd.-137th Ave.
D57		6-Mile Road
D58	Oleta River	NE 215th St.
D59		NE 209th Terr.
D60		NE 203rd St.
D61		Miami Gardens Drive
D62		Oleta Drive
D63		West Dixie Highway
D64	Black Creek	Salinity Dam-East-SW 87th Ave.
D65		Salinity Dam-West-SW 87th Ave.
D66		Old Cutler Road
D67	Bel-Aire Canal	Caribbean Blvd - Bel-Aire
D68		Fla. Utilities Downstream
D69	Black Creek Canal	Flood Control Dam
D70		US #1 - South
D71		US #1 - North
D72		Broad Channel - Downstream
D73		Coral Reef Drive
D74		Richmond Drive
D75		Eureka Dr. - East
D76		Quail Roost Drive
D77		Eureka Dr. - West
D78		Railroad Bridge
D79		Dog Leg Turn
D80		Krome Ave.
D81	Snapper Creek	Red Road-Salinity Dam-South
D82		Red Road-Salinity Dam-North
D83		Red Road Bridge at Kendall Dr.
D84		Dixie Highway
D85		SW 76th Ave.
D86		SW 87th Ave.
D87		SW 97th Ave.
D88		Sunset Drive

APPENDIX A-1 (Continued)

SAMPLING STATIONS

STATION	CANAL	LOCATION
D89	Snapper Creek	Miller Road
D90		SW 40th St.
D91		SW 24th St.
D92		Tamiami Trail
D93	Southern Canal	SW 31st St. and 120th Rd. - Upstream
D94		11778 SW Village Green Dr. - Downstream
D95	Coral Gables Waterway	LeJeune Rd.
D96		Dixie Highway North
D97		Dixie Highway South
D98		Student Lake - South Footbridge
D99		Student Lake - Behind Ring Theatre
D100		Student Lake - North Footbridge
D101		Bird Road
D102		Golf Course Footbridge
D103		Alhambra
D104		Red Road Dam - East
D105		Red Road Dam - West
D106		SW 67th Ave.
D107		Coral Way
D108		SW 8th St.
D109	Miami River	Brickell Ave.
D110		NW 5th St. Bridge
D111		Wagner Creek
D112		NW 27th Ave.
D113	Comfort Canal	NW 22nd Ave.
D114		NW 27th Ave. - East of Dam
D115		NW 27th Ave. - West of Dam
D116		NW 37th Ave.
D117	Tamiami Canal	SRD - Miami Paper
D118		NW 21st St.
D119		Lejeune Rd.
D120		NW 57th Ave. and 7th St.
D121		SW 72nd Ave. and Flagler St.
D122		SW 87th Ave.
D123		SW 97th Ave.
D124		SW 137th Ave. & Tamiami Trail
D125	FEC Canal	NW 25th St.
D126		NW 58th St. - Air Control
D127		Atomic Plant
D128		Rendering Plant
D129	Miami River	Maule Bridge
D130		Lehigh Bridge
D131		Railroad Bridge
D132	Borrow Canal	Rosedale and Ludlam
D133		NW 36th St.
D134	Melrose Canal	Melrose and Osage Dr.
D135		Morningside and S. Esplanade

APPENDIX A-1 (Continued)

SAMPLING STATIONS

STATION	CANAL	LOCATION
D136	Miami River	NW 47th Ave.
D137		S. of 36th St. Bridge - N. of Dam
D138		S. of Dam - 36th St.
D139	Biscayne Canal	Above Salinity Dam - West
D140		Below Salinity Dam - East
D141		113th St. and NE 6th Ave.
D142		W. Dixie Highway
D143		NE 131st St.
D144		135th St. and Griffing Blvd
D145		Memorial Highway and Miami Ave.
D146		154th St. and NW 7th Ave.
D147		NW 22nd Ave. - Opa Locka Blvd.
D148		Atlantic and Sesame
D149		NW 60th Ave. and 138th St.
D150		NW 67th Ave. and 138th St.
D151		W 18th Ave. and 84th St.
D152		NW 67th Ave. and 166th St.
D153		Red Road
D154		NW 32nd Ave. and 153rd St.
D155	Snake Creek	(East of Salinity Dam) Bridge
D156		US #1 and Dixie Highway - West of Dam
D157		170th St. and NE 15th Ave.
D158		Miami Gardens Dr. & NE 13th Ave.-183rd St.
D159		Rt 441 - NW 2nd Ave.
D160		Sunshine State Parkway
D161		NW 27th Ave.
D162		Bridge at NW 27th Ave. - Canal B
D163		NW 27th Ave. & 207th St. - Miramar Canal
D164		NW 37th Ave.
D165		Carol City Canal Bridge-NW 39th Ave.
D166		NW 47th Ave.
D167		NW 67th Ave.
D168		NW 77th Ave.
D169		NW 175th St. & 77th Ct. - Peter Pike
D170		NW 179th St. & 77th Ct. - Peter Pike
D171	C-103	Tallahassee Rd. (SW 137th Ave.)
D172		Bridge East of Tallahassee Rd. (SW 137th Ave)
D173		Campbell Dr. (SW 312th St. & 150th Ave)
D174		US #1 - South
D175		Tennessee Rd. - 167th Ave.
D176		Krome Ave.
D177		Campbell Dr. (SW 312th St. & 137th Ave)
D178		Biscayne Dr. (SW 288th St.)
D179		US #1 - North
D180		Tennessee Road

APPENDIX A-1 (Continued)

SAMPLING STATIONS

Dade County

Miami Beach Bacteriological Water Quality Data

Dade County Health Department

STATION		LOCATION
D201	Atlantic Ocean	Miami Beach Pier
D202		10th Street
D203		15th Street
D204		21st Street
D205		31st Street
D206		36th Street
D207		43rd Street
D208		65th Street
D209		69th Street
D210		71st Street
D211		74th Street
D212		76th Street
D213		80th Street
D214		84th Street
D215		88th Street
D216		96th Street
D217		Bakers Haulover
D218		Haulover Pier
D219		175th Street
D220		Golden Beach

APPENDIX A-1 (Continued)

SAMPLING STATIONS

Dade County

Federal Water Quality Administration

STATION	LOCATION
1	Coral Gables Waterway, North Branch at eastern tip sea wall and Channel Marker.
2	South branch Coral Gables Waterway, in mouth of canal as it enters Biscayne Bay at east end sea wall.
3	Matheson Hammock Park, west of junction of incoming canals, between flag pole and channel marker, entrance to harbor.
4	Snapper Creek Canal at mouth at entrance to Biscayne Bay.
5	Florida City Canal at mouth as it enters Biscayne Bay.
6	Military Canal at mouth as it enters Biscayne Bay.
7	Dinner Key Marina off east end of Pier 5.
8	Biscayne Bay south of Fair Isle Causeway, due east of Tennis Courts (Coconut Grove), south of 2 white buildings. Off shore about 50 feet near a sewage outfall.
9	Rickenbacker Causeway, east end, on north side bridge near shore, close to large rectangular hole in bulkhead.
10	Bear Cut, south on west of Bear Cut Bridge about mid-channel, between Institute of Marine Sciences seahut and Crandon Marina.
11	Government Cut between Fisher Island and Miami Beach. Between Channel Markers 13 and 2M. Near Belcher Oil Tank Farm and Coast Guard Base.
12	Government Cut between Chalks Flying Service on Watson Park Island and west end of Dodge Island.
13	Biscayne Island (south side) (Venetian Causeway) along row of apartment buildings (cream colored).
14	Miami River at mouth between Brickell Point and DuPont Plaza Hotel. West of Brickell Avenue Bridge.
15	Little River Canal, south branch, at mouth as it enters north Biscayne Bay.
16	Little River canal, north branch, at mouth as it enters north Biscayne Bay.
17	Biscayne Canal at mouth at entrance to north Biscayne Bay. Near a large (tall) cream-colored apartment building.
18	Arch Creek at south end Keystone Islands. Inside bridge (W) from road branching off from Broad Causeway. Near a motel.
19	Near Arch Creek, in dredged channel just before first basin at north end of Keystone Islands complex.
20	Intracoastal Waterway at Golden Beach at second oval man-made island, across from lance-shaped tributary lagoon extending west.

APPENDIX A-1 (Continued)

SAMPLING STATIONS

STATION	LOCATION
21	Oleta River near SR 826 (North Miami Beach Boulevard) highway bridge, down stream from fishing camp and Maule Lake.
22	Intrecoastal Waterway south of Sunny Isles complex, at ICWW Channel Marker No. 61.
23	Intracoastal Waterway north of Sunny Isles complex at ICWW Channel Marker No. 57.
24	Maule Lake effluent canal, north end lake, west of ICWW Channel Marker No. 55, narrow neck between lake and canal.
25	Goulds Canal at mouth, near Standard Oil Station.
26	C-1 Canal, Black Creek Canal near mouth, below salt water dam. (Note: Enter on south side of breakwater).
27	Coral Gables Waterway from Ponce De Leon Boulevard at Riviera Drive (north branch).
28	Coral Gables Waterway from Ponce De Leon at Theodore Dickinson Drive (south branch).
29	Miami River at N. W. 17th Avenue Bridge.
30	Snapper Creek Canal from Red Road Bridge (S. W. 57th Avenue) at Intersection North Kendall Drive (S. W. 88th Street).
31	C-100 Canal at Cutler from Old Cutler Road.
32	C-1, Black Creek Canal from bridge on Old Cutler Road.
33	Goulds Canal from bridge on South Allapattah Road.
34	C-102 from bridge at intersection of S. W. 107th Avenue and Moody Drive.
35	Military Canal from bridge on S. W. 107th Avenue.
36	C-103 from Bridge on Six Mile Road.
37	North Canal from bridge on Six Mile Road.
38	Florida City Canal from bridge on Six Mile Road and intersection Palm Drive (S. W. 344th Street).
39	Intracoastal Waterway at Lake Villa, north of bridge.
40	Little River Canal at North Miami Avenue Bridge.
41	Biscayne Canal off Griffing Boulevard, near Miami Shores Country Club, from foot bridge from atop USGS gage.
42	Arch Creek from bridge at US 1.
43	Snake Creek (Royal Glades Canal) at 19th Avenue.
44	Oleta River from bridge on Miami Gardens Drive, north end of Greynolds Park.
45	Dinner Key Boat Basin at Underwood Marina, off from stone house.
46	C-100 at mouth.
47	C-102 at mouth.
48	C-103 at mouth.
49	North Canal at mouth - Homestead Bayfront Park. (Canal now blocked off - goes to Moung Canal).

APPENDIX A-1 (Continued)

SAMPLING STATIONS

STATION	LOCATION
50	Florida Power and Light Company Turkey Point Power Plant intake canal.
51	Mouth of Grand Canal, (effluent canal from Turkey Point Power Plant).
52	Model Land Canal at mouth.

APPENDIX A-2

SUMMARY OF ANALYTICAL RESULTS

Reconnaisance Samples, Miami to Hollywood, Florida

Rivers, Canals and Intracoastal Waterway

Station Number	Water Temp ^oC	pH	DO mg/1	BOD mg/1	Cl mg/1	Total PO_4 as P mg/1	Soluble PO_4 as P	TKN-N as N	NH_3-N as N	NO_3-N as N	No. of Samples
1	22.5	7.9	6.7	1.7	15,800	0.08	0.06	0.22	0.10	0.16	6
2	24.5	8.0	7.0	1.4	17,000	0.02	0.05	0.17	0.05	0.01	5
3	22.5	7.9	7.0	1.6	17,200	0.04	0.01	0.22	0.02	0.01	3
4	21.0	7.7	5.0	1.2	15,200	0.08	0.07	0.44	0.45	0.11	8
5	21.5	7.7	6.7	2.3	13,700	0.06	0.03	0.43	0.24	0.01	7
6	23.5	7.8	3.9	4.2	9,100	0.40	0.39	0.68	0.41	0.09	8
7	23.5	8.0	6.8	2.0	17,500	0.03	0.01	0.18	0.04	0.01	6
8	23.5	8.1	7.4	2.6	17,800	0.12	0.02	0.29	0.11	0.01	5
9	20.5	8.0	7.4	2.0	18,600	0.04	0.02	0.15	0.02	0.01	1
10	24.0	8.1	7.4	1.7	19,400	0.04	0.03	0.06	0.03	0.02	4
11	24.0	8.1	7.1	1.3	19,300	0.02	0.03	0.04	0.03	0.01	3
12	21.5	8.1	7.6	2.0	18,100	0.02	0.02	0.14	0.03	0.01	3
13	22.0	8.0	8.4	1.9	18,200	0.02	0.01	0.10	0.02	0.01	2
14	23.0	7.9	5.6	1.2	14,300	0.05	0.02	0.34	0.13	0.05	10
15	24.0	7.9	5.4	1.6	11,500	0.07	0.05	0.44	0.19	0.10	7
16	22.5	7.9	6.1	1.6	14,400	0.05	0.04	0.28	0.06	0.06	7
17	24.5	8.0	6.0	1.2	15,000	0.04	0.03	0.21	0.10	0.02	6
18	24.5	8.1	7.0	2.6	17,900	0.06	0.04	0.13	0.03	0.01	5
19	25.0	8.1	7.3	1.4	18,800	0.04	0.02	0.05	0.04	0.01	5
20	25.5	7.7	5.9	1.4	14,500	0.24	0.11	0.47	0.27	0.22	7
21	23.5	7.6	5.7	2.1	8,300	0.21	0.17	0.59	0.18	0.22	10
22	27.5	8.0	7.1	2.2	12,200	0.07	0.06	0.20	0.07	0.05	7
23	24.5	7.9	6.9	1.8	13,100	0.07	0.06	0.23	0.12	0.19	10
24	24.5	7.8	7.1	2.7	10,900	0.18	0.14	0.60	0.25	0.20	6
25	22.5	8.0	4.9	1.6	11,100	0.21	0.22	0.47	0.24	0.10	5
26	23.5	8.0	4.2	2.0	9,100	0.34	0.32	0.66	0.38	0.15	5
27	24.0	7.4	3.9	1.9	4,800	0.34	0.33	0.61	0.39	0.70	11
28	24.0	7.4	6.0	1.3	3,800	0.13	0.16	0.21	0.06	0.81	11
29	23.5	7.6	2.8	1.0	2,000	0.05	0.05	0.79	0.32	0.15	10
30	23.5	7.5	2.7	3.9	47	0.73	0.66	2.0	1.32	0.18	10

APPENDIX A-2 (Continued)

Station Number	Water Temp °C	pH	DO mg/1	BOD mg/1	Cl mg/1	Total PO_4 as P mg/1	Soluble PO_4 as P	TKN-N as N	NH_3-N as N	NO_3-N as N	No. of Samples
31	23.5	7.7	8.2	1.0	34	0.01	0.01	0.12	0.02	0.01	10
32	24.0	7.4	5.6	4.9	33	1.12	0.89	2.19	1.40	0.26	10
33	24.0	7.6	6.6	1.0	56	0.02	0.04	0.04	0.05	3.28	7
34	24.0	7.4	8.5	0.56	36	0.01	0.02	0.02	0.02	1.56	9
35	24.5	7.8	6.9	15.1	94	2.50	2.12	4.18	2.91	0.84	12
36	23.5	7.7	7.6	1.7	108	0.02	0.01	0.15	0.02	1.14	6
37	24.0	7.7	8.8	1.6	51	0.02	0.02	0.18	0.04	0.95	7
38	24.0	7.6	6.8	1.2	48	0.01	0.02	0.14	0.03	0.95	6
39	25.0	7.7	6.1	1.8	14,300	0.23	0.20	0.05	0.32	0.21	6
40	24.0	7.7	3.1	1.8	590	0.13	0.10	0.77	0.13	0.31	9
41	24.0	8.0	8.3	3.1	57	0.11	0.28	0.64	0.09	0.03	9
42	24.5	7.8	6.0	1.7	14,100	0.06	0.04	0.23	0.11	0.06	9
43	24.0	7.9	6.6	3.4	128	0.31	0.29	0.98	0.31	0.46	9
44	24.0	7.6	4.7	1.7	5,900	0.64	0.64	0.95	0.60	0.46	8
45	24.5	8.1	6.8	1.8	17,600	0.24	0.016	0.24	0.03	0.01	3
46	25.0	8.4	6.6	1.7	13,100	0.015	0.010	0.20	0.03	0.02	3
47	23.5	7.9	5.9	2.2	6,900	0.02	0.02	0.31	0.08	0.50	4
48	23.5	7.7	5.4	3.0	10,200	0.02	0.02	0.27	0.08	0.05	5
49	21.5	7.7	4.0	2.6	15,800	0.08	0.07	0.32	0.20	0.02	1
50	24.0	8.1	7.6	0.8	15,200	0.01	0.02	0.19	0.07	0.05	4
51	28.5	8.1	7.7	1.9	16,100	0.02	0.05	0.14	0.04	0.04	4
52	23.0	7.6	4.9	1.0	14,800	0.01	0.01	0.33	0.18	0.05	2

NOTE: Analytical results given for sampling stations 1-52 are average values for the number of samples indicated. Samples were collected at mid-depth intermittently during the period February-May 1969.

MR. HAGAN: In July of 1970 the Governor of Florida and the Florida State Air and Water Pollution Control Board requested assistance from the Federal Water Quality Administration in determining the pollution abatement requirements of Dade County.

This report discusses the effects on water quality of the numerous waste sources discharging into the canals, coastal waters and ocean in and adjacent to Dade County, Florida. The necessary actions required to alleviate the problems are also discussed. Data for this report were furnished by the Florida State Air and Water Pollution Control Board, and additional data were collected by the Federal Water Quality Administration, Lower Florida Estuary Study.

Cooperation and assistance in the form of data, reports, and other information necessary to the preparation of this report have been extended by several agencies and individuals. Their contribution to this effort is gratefully acknowledged.

Dade County is the largest county in Florida. It has an area of 2,052 square miles, of which less than 200 is presently under development. An additional 650 square miles of land in the county is readily developable. The land presently under development is on the Atlantic Coastal Ridge, which extends down the east coast from the northern county line to Homestead. The remainder of the county, south and west of the Atlantic Coastal Ridge, consists of the Everglades. Most of the Everglades National Park is located in Dade County.

The city of Miami is a light manufacturing center, in which the major types of production are: food products, fabric products, furniture and fixtures, printing and publishing, and fabricated metal products. Industries producing these items account for 33.2 percent of the total manufacturing firms in the Metropolitan Miami area.

The largest employers in the county are service organizations, including hotels and restaurants. Dade County is a major vacation resort, and in 1969 almost 200,000 overnight facilities were available. Restaurants in the county have a seating capacity of over 200,000 customers. The center of the resort area is Miami Beach, which is located on the barrier islands that separate the eastern coast from the Atlantic Ocean.

The highly productive agricultural area south of Miami produces potatoes, tomatoes,limes, avocados, mangos and other crops during the entire year.

Biscayne Bay, another economic asset, is an important commercial fishery. In 1965 bait shrimp valued at $393,600, stone crabs valued at $145,828, and spring lobsters valued at $81,000 were landed in the bay. The bay is also an extremely important recreational area, which is used for sport fishing, boating, water skiing, swimming and diving.

The major island waterways in Dade County are canals which connect the Everglades and the Conservation Areas 3A and 3B in the western part of the county with the urban and agricultural areas located on the coastal highlands adjacent to Biscayne Bay. Flow in these canals is controlled by structures operated by the Central and Southern Florida Flood Control District. The canals are operated to prevent floods, to recharge the groundwater, and to prevent salt water intrusion.

During periods of heavy rainfall, the canals carry excess runoff to Biscayne Bay and reduce the flooding of the lowlands in Dade County. When rainfall is light the canals will be used to collect runoff from the urban areas for backpumping into the Conservation Areas, where groundwater recharge occurs.

All of the canals discharging to Biscayne Bay are equipped with salinity dams which allow fresh water to flow into the Biscayne Bay but prevent the salt water from entering the canals.

The most significant waterways in Dade County with respect to hydrology are Snake Creek, Miami River, Snapper

Creek, Little River, Tamiami Canal and Biscayne Canals and Taylor Slough. The combined flow from the canals discharge during the period of 1960 to 1968 was 1,460 cubic feet per second, which was 75 percent of the total eastward runoff from all Dade County canals.

Snake Creek Canal has the greatest discharge of any coastal canal. It is 21.5 miles long and has a drainage basin of 84 square miles. During the 1960 to 1968 period, the average discharge at the salinity dam was 403 cubic feet per second.

The Miami Canal is Dade's second largest coastal canal, with a length of 20 miles and a drainage area of 111 square miles. The discharge upstream of the salinity dam averaged 347 cubic feet per second during the 1960 to 1968 period. Highest flows occur during the summer and early fall months of September, October and November. Lowest flows occur during the spring, in April and May.

The principal source of potable, industrial and agricultural water supply in Dade County is the Biscayne aquifer. This is a highly permeable limestone and sandstone formation which is 80 to 150 feet thick on the eastern coast and diminishes to about 10 feet thick on the western side of the county. Ground and surface water levels in Dade County are interconnected, since the Biscayne acquifer extends to just below ground surface. The water table rises with local rainfall, surface water inflows and seepage from the conservation areas. On the other hand, it drops in response to losses by evapotranspiration and surface water outflow.

The water table in northeastern Dade County has been relatively stable since the completion of the canal system in that area during 1955. In southern Dade the canal system was not completed until 1968 and much greater fluctuations of the water table have been observed in that area.

There are two major municipal water supply well fields in the metropolitan Miami area. The Hialeah-Miami Springs well field is located in the vicinity of the Miami Canal and produces an average of 80 million gallons per day as of 1968. The southwest Dade County well field is located near Snapper Creek Canal and its average pumpage was 60 million gallons per day in 1968.

Dade County has experienced a sustained population growth for almost 40 years. This growth is expected to continue for the next 50 years.

Preliminary 1970 census figures indicate 1,259,184 residents in Dade County. It is estimated that at the peak of the tourist season there are an additional 320,000 tourists and occasional residents. Thus the total population for which municipal services should be provided in 1970 was near 1,580,000.

Fifty-year projections indicate a continued growth in both urban residential and tourist and occasional residents, with a severe loss in rural-farm populations. Within the next decade, municipal utility services must be prepared to serve almost 1.8 million people and by the year 2020 these services must be available to approximately 2.7 million people.

Information on municipal waste sources was obtained from three inventories: the Federal Water Quality Administration's STORET listings, the State Department of Health and Rehabilitative Services inventory,and a State Department of Air and Water Pollution Control inventory.

Water quality data for the freshwater portions of the canal system originated with the Dade County Pollution Control Department and was obtained through the Florida Department of Air and Water Pollution Control. Water quality data for the estuarine portions of the canals and the near shore areas of Biscayne Bay were collected by a Federal Water Quality Administration Lower Florida Estuary Study.

Finally, coliform bacteria data from the bathing beach areas of the Atlantic Ocean were obtained from the Dade

County Health Department and coliform bacteria data around the ocean outfalls came from the Dade County Pollution Control Department.

After careful review, it was determined that the inventory information is incomplete and out of date and that specific conclusions and recommendations regarding individual waste sources could not be made on the basis of this information. However, the water quality data are believed to be generally sound and reliable, although several irregularities were noted in the tabulated water quality data.

Waste sources.

There are 113 separate sewage treatment installations in Dade County. Of these 113, 40 are considered major systems serving an estimated 421,700 persons. This represents only 27 percent of the total population served by sewage collection systems and major treatment plants.

Twenty-two of the forty major treatment facilities are privately owned, the remaining eighteen being owned by the city, county or Federal governmental units.

County-wide treatment facilities have an installed capacity of over 181 million gallons per day and an estimated actual flow of 100.9 million gallons per day. However, almost all the excess capacity is in two systems using ocean outfalls without treatment, namely North Miami and Miami Beach. Design and flow data are not available for all treatment facilities. Of the 27 systems for which such data are available, 8 are hydraulically overloaded. Those 8 plants have an installed capacity of 5.6 million gallons per day and an estimated flow of 7.9 million gallons per day. They are: Riverdale Estates, Andover, Miami Lakes, Westwood Lakes, Snapper Creek Park, Bel-Aire, South Miami Heights, and the South Dade Labor Camp, which is federally owned.

Thirty systems having a combined flow of 24.8 million gallons per day discharge treated effluent into the inland canal system. These canals are operated for flood control and may have prolonged periods of minimal flow. In these sluggish waters sewage pollution in the form of dissolved and suspended organic material, solids deposits and bacteria can accumulate to such concentration as to cause nuisance and health hazards.

Four collection systems having a combined flow of 75 million gallons per day discharge into the Atlantic Ocean through three outfalls: Miami, Miami Beach and North Miami. North Miami discharges approximately 11 million gallons a day of raw sewage through an 11,000-foot ocean outfall. Miami Beach provides no treatment, but discharges about 17 million gallons per day of raw sewage through a 6,900-foot outfall at a depth of 40 feet. The city of Miami outfall discharges an estimated 47 million gallons per day approximately 4,600 feet offshore at a depth of only 16 feet. However, this plant provides intermediate activated sludge treatment prior to discharges. No figures were available as to the treatment efficiency provided by this plant.

Three systems discharge an estimated 0.6 of a million gallons per day to the intracoastal waterway and Biscayne Bay. Finally, three systems discharge an estimated half million gallons per day to the groundwater through tile fields or drain fields.

Primary treatment plants, which consist essentially of settling tanks and sludge digesters, can remove most settleable solids, about one-third of the biochemical oxygen demand and approximately 50 percent of the bacteria. Secondary plants include secondary biological treatment units, such as oxidation lagoons, trickling filters, or activated sludge systems. These plants can remove 90 to 95 percent of the BOD, suspended solids and coliform bacteria. Chlorination facilities for the disinfection of properly treated sewage can destroy more than 99 percent of the sewage bacteria. To accomplish these reductions, however, treatment facilities must be properly designed, must have adequate operating funds, and must be skillfully operated.

The Hollis Report, which has not yet been introduced but I think will be introduced later in the conference, estimates that there are 143,000 septic tank installations in Dade County serving an estimated half million people. Based on the 1970 population figures and the estimated population served by the treatment plant, as many as 837,000 people may be on septic tanks or are discharging raw sewage. This represents 58 percent of the 1970 population. The shallowness of the water table, porosity of the shallow aquifer and the number of private wells used for water supply and lawn irrigation present opportunities for contamination and constitute a definite health hazard.

Conclusions developed from a comparative study of the canals in areas served by sewers and by septic tanks state that higher BOD and lower dissolved oxygen in the lower levels and luxuriant algae growth in the surface layer of canals in the septic tank area can be attributed to the septic tank effluent. Thus there is evidence that in addition to causing a health hazard, septic tanks may contribute to the total load of pollution material carried by the waterways in their drainage area.

There are approximately 74 plants serving apartment houses, trailer parks and shopping centers which are small extended aeration package units or septic tanks. Kiker, in work done on small plants throughout the State of Florida, including Dade County, concluded that these package units functioned properly only if they are operated and maintained adequately and in most cases they are not. Of 14 plants tested in Kiker's studies, only three met the current State requirements of 90 percent BOD reduction.

In most instances the small package plants discharge to the nearest convenient waterway. Furthermore, they usually serve facilities with a highly mobile and variable population, a factor which contributes to poor performance. No estimate can be made of the total load of pollution from these sources since performance and loading data are not reported in the inventory, but the number of plants in this category would suggest that they may be a significant source of pollution.

No data are presently available to FWQA concerning the identity, number or location of industrial waste discharges or the load or effects on water quality from such discharges.

Due to the incomplete waste source data, only general conclusions can be reached.

About one-third of the residential population is known to be served by major sewage collection and treatment systems. Of these 40 major facilities, at least 8 plants are known to be hydraulically overloaded.

Over 1 million people in Dade County are served by septic tanks and small package plants for the disposal of sewage and domestic wastes.

An accurate inventory of all municipal and industrial waste sources and a determination of the waste loads which each contributes to the waterways and their treatment plant performance is a very first and very basic requirement.

The State of Florida water quality standards were approved and accepted by the Secretary of the Interior on January 17, 1969. Under Sections 28-5.21 and 28-5.09 of the Rules of the Florida Air and Water Pollution Control Commission, all waters in Dade County are classified as Class III: Recreation Propagation and Management of Fish and Wildlife, with the exception of the Miami River, which is Class V: Navigation, Utility and Industrial Use. Section 28-5.01 expresses the "intent of the State of Florida to review Class V stream classifications periodically as often as necessary, and as water quality of such areas improves, hearings will be held and reclassification shall be established. It is expected that in all instances, presently classified as Class V waters, there shall be decided and definitive enhancement not later than January 1, 1973."

Effluent standards under Section 28-5.04 require a minimum of 90 percent treatment of organic material for both municipal and industrial wastes. Additional treatment may be required as needed to meet water quality criteria of the receiving stream.

Section 24-13 of the Dade County Ordinance added by Ordinance Number 70-44, dated June 2, 1970, concerns septic tanks. It says: "Where public water supply is used, no septic tank shall be installed...where greater than 1,500 gallons per day per unsubmerged acre of land will be generated by the actual or projected use." Where public water supplies are not used the allowable discharge shall not exceed 750 gallons per net acre per day.

Sewage contains a variety of obnoxious constituents which can damage water quality and restrict its use. Sewage contains astronomical numbers of intestinal bacteria which are related to man's excretions. Some of these bacteria may be pathogens which can infect man with a variety of diseases.

Oxygen-demanding materials found in sewage can limit or destroy fish, shellfish, fish food organisms, and other desirable aquatic life by removing the dissolved oxygen from the water.

The oxygen demand of sewage, as measured by the 5-day biochemical oxygen demand test, indicates their potential for reducing the dissolved oxygen content of the waters. The coliform bacteria content of raw and treated sewage discharged to a watercourse indicates the density of sewage associated bacteria, which may include disease-producing organisms.

Most of the data discussed in this report were collected by the Dade County Pollution Control Department during 1968 and 1969. Additional data were collected by FWQA's Lower Florida Estuary Study.

Canals reported to have serious pollution problems are discussed in detail in this section of the report. They are: Miami River, Coral Gables Waterway, Snapper Creek, Biscayne Canal, Tamiami Canal, Little River Canal, Snake Creek Canal, and the Oleta River. Relatively unpolluted canals discharging into lower Biscayne Bay are briefly discussed. All canals discussed except the Miami River are classified for Recreation and Propagation and Management of Fish and Wildlife, Class II.

Coral Gables Waterway.

The Coral Gables Waterway begins at the Tamiami Canal and extends approximately 7.2 miles to the northern part of middle Biscayne Bay.

MR. STEIN: That is Class III, isn't it, not Class II?

MR. HAGAN: I am sorry, that is correct, Class III.

MR. STEIN: All right.

MR. HAGAN: In 1968 all of the sampling stations at the north branch of the Coral Gables Waterway and the main canal had mean dissolved oxygen concentrations less than the Federal, State and local standards of 4 milligrams per liter with the exception of one station. The lowest dissolved oxygen concentration of 1.9 milligrams per liter occurred just below the salinity dam. This station is 0.2 of a mile upstream from the Veterans Administration Hospital sewage treatment plant, which discharges 0.3 of a million gallons per day of treated sewage into the canal. This reach of the canal is affected by the tide, and waste discharges would be distributed both upstream and downstream from their points of entry.

The mean dissolved oxygen concentration in 1968 of the water entering from the Tamiami Canal was 3.2 million gallons per liter. Downstream from this point 1.5 million gallons per day from the West Coral Way Subdivision enters the Coral Gables Waterway. The critical point in this reach occurs at mile 4.9, where the mean dissolved oxygen was 2.1 milligrams per liter in 1968.

DO concentrations in the south branch of the Coral Gables Waterway were considerably higher than in the north branch. The highest mean concentration was 6 milligrams per liter in 1968, which is at a station in the Student Lake on the University of Miami campus. The minimum concentration at this station was 2.8 milligrams per liter, which is also in violation of the standards. The city of Coral Gables sewage treatment plant discharges 2.4 million gallons a day of treated sewage into the south branch of the canal.

In general, the mean DO concetrations in 1969 were lower than in 1968. At most stations the 1969 values were about 1.0 milligram per liter lower, indicating a deteriorating water quality. In 1969 the mean dissolved oxygen of the water entering the Coral Gables Waterway from the Tamiami Canal was 1.4 milligrams per liter, which is considerably lower than the average concentration in 1968. In the freshwater reach of the canal, the DO was 2.8 milligrams per liter west of the salinity dam. That would be above the salinity dam. The lowest mean DO concentration in 1969 was 2.0 milligrams per liter. This occurred at mile point 3.3. The dissolved oxygen in this reach in 1969 never reached 4.0 milligrams per liter.

The 5-day BOD concentrations in the Coral Gables Waterway were significantly greater in 1969 than in 1968, again indicating an increase in the quantity of waste discharged to the waterway. Extremely high BOD concentrations of 9.2 milligrams per liter in 1968 and 8.3 milligrams per liter in 1969 were observed approximately 0.5 mile downstream of the West Coral Way subdivision sewage treatment plant. In the estuarine reach of the waterway, the mean BOD concentration increased upstream of both treatment plants in this estuarine reach.

Upstream of the salinity dam very high coliform densities were observed below the West Coral Gables sewage treatment plant. A mean density of 104,600 MPN's per 100 milliliters in 1968 and a mean density of 46,400 MPN's per 100 mls. in 1969 were observed.

I might interject here that the standard for coliform is 1,000 per 100 milliliters.

Excessive bacterial densities were also observed in the vicinity of the two sewage treatment plants located downstream of the salinity dam. Bacterial densities in 1969 were generally lower than those in 1968. All stations in the Coral Gables Waterway had total coliform densities which violate the Federally adopted State of Florida water quality standards of 1,000 MPN per 100 ml, as well as those of Dade County during most of the times during 1968 and 1969.

The Miami River Canal flows from Lake Okeechobee in a southeasterly direction through the water conservation area into upper Biscayne Bay just north of Rickenbacker Causeway.

The section of the waterway discussed in this report is the lower 15 miles. A salinity dam at mile 5.2 near northwest 36th Street regulates the flow and prevents salt water intrusion. The river below this dam is a tidal estuary.

The Miami River Canal is polluted by the raw sewage discharged from numerous apartments, private homes, industrial and commercial establishments, and from houseboats and live-on boats. A Dade County pollution control report indicates that more than 910,000 gallons per day of raw sewage is discharged into this waterway. In addition, 22,000 gallons per day finds its way into the river from drain fields, 22.6 thousand gallons per day is discharged by houseboats and live-on boats. The report also states that 145,000 gallons per day of treated effluent is discharged by 5 small package plants and that during storms as much as 1,764 million gallons per day of stormwater runoff reaches the river from 86 storm sewer outfalls.

Dissolved oxygen concentrations upstream of the salinity dam were extremely low, and the concentrations observed in 1968 and 1969 were approximately the same. Mean DO concentrations in this reach ranged from 1.6 to 1.1 milligrams per liter.

Mean concentrations below the salinity dam were 1.3 milligrams per liter in 1968 and 1.0 milligrams per liter in

1969. The maximum concentrations observed at this location were 3.6 milligrams per liter in 1968 and 2 milligrams per liter in 1969. All mean DO concentrations in the Miami River were well below the 4 milligrams per liter standard, indicating that an extremely serious pollution problem exists. The Federal-State classification for the Miami River is for navigation, utility and industrial use and is required only to be aerobic. However, the Dade County standard makes no such exception and the Dade County standard is being violated.

Concentrations of BOD were greater in 1969 than in 1968. The highest mean value in the freshwater reach of the canal was 4.3 milligrams per liter in 1969, upstream from the salinity dam. Downstream from the dam the highest mean of 5.9 milligrams per liter in 1969 was found at the mouth of the river.

The FWQA study found an average of 1.2 milligrams per liter of BOD at the mouth and 1.0 milligram per liter downstream from the Comfort Canal entrance.

Most of the total coliform densities violated the 1,000 MPN per 100 ml. standard, with the exception of a station at mile 15, which were 869 in 1969 and 590 MPN in 1968. The highest mean bacterial densities occurred at mile 1.7. They are 215,000 MPN per 100 ml. in 1968 and 66,000 per 100 ml. in

1969.

The Miami River is so acutely polluted that if it were backpumped as proposed it could cause serious pollution problems in the water conservation areas. Water from the river also serves to recharge the groundwater supply and pollution of groundwater could eventually occur if water quality in this canal remains the same or deteriorates further.

Snapper Creek Canal.

The Snapper Creek Canal extends 12 miles from the Tamiami Canal to central Biscayne Bay. Three major sewage treatment plants discharge into the Snapper Creek Canal. The largest discharges 2.6 million gallons per day and serves the Westwood Lake subdivision. The Snapper Creek Park subdivision discharges 1.05 MGD of effluent into the canal and the Southern Estates subdivision plant discharges 475,000 gallons per day.

Mean dissolved oxygen concentrations in Snapper Creek were extremely low during the 1968-1969 study period. The 1968 mean values ranged from 1.7 to 0.8 milligrams per liter. Conditions were even worse in 1969, when the mean DO concentration ranged from 1.4 to 0.5 milligrams per liter, with only one station having a mean dissolved oxygen concentration of greater than 1 milligram per liter. The mean DO at the mouth of the canal in the tidal portion was 5 milligrams per liter and was

2.7 milligrams per liter at mile 2.6 during the FWQA study. Dissolved oxygen concentrations violate both Federal-State and county standards.

The highest mean BOD concentrations of 4.9 milligrams per liter in 1968 and 4.5 milligrams per liter in 1969 occurred at mile 6.7 just downstream from the three waste discharges. Mean BOD concentrations measured during the FWQA study were 1.2 milligrams per liter at the mouth and 3.9 milligrams per liter at mile 2.6. All mean coliform densities exceeded the 1,000 MPN per 100 ml. standard.

The Biscayne Canal has a length of approximately 12 miles and flows from the Palmetto Expressway to upper Biscayne Bay between the Broad and 79th Street Causeways. The Opa Locka Canal extends from the Palmetto Expressway to the Biscayne Canal and has a length of approximately 7 miles. The only major sewage treatment plant discharging into the Biscayne Canal is the Dade County Port Authority, which has a design flow of 1.0 MGD. There are no known major discharges to the Opa Locka Canal. The spillway is located on the Biscayne Canal, 5 miles upstream of the mouth.

The mean 1968 dissolved oxygen concentrations in Biscayne Canal were greater than 4.0 milligrams per liter, with the exception of a concentration of 3.8 below the spillway.

In 1969 only 3 stations had concentrations equal to or greater than 4.0 milligrams per liter. This represents a drastic deterioration in the water quality in this canal. Water quality also deteriorated between 1968 and 1969 in the Opa Locka Canal based on DO. The FWQA study found an average DO concentration of 6.0 milligrams per liter and an average BOD of 1.2 milligrams per liter at the mouth of the Biscayne Canal. Just upstream of the spillway, the mean DO concentration was 8.3 milligrams per liter and BOD was 3.1 milligrams per liter.

At most stations the mean BOD was greater in 1969 than 1968.

All mean total coliform bacteria densities in both Biscayne and Opa Locka Canals violated the standard of 1,000 MPN per 100 ml. In general, densities in 1968 were higher than in 1969.

The Tamiami Canal parallels U. S. Highway 41 from the west coast of Florida into Miami, where it ultimately discharges into the Miami River. The only documented waste source entering the canal from mile 12 to the mouth are two sewage treatment plants at the Miami International Airport which discharge 0.436 and 0.346 MGD respectively. The mean DO concentrations in the Tamiami Canal at all stations were greater in 1968 than in 1969. The lowest mean DO concentrations, ranging from 1.6 to 0.9

milligrams per liter, occurred between mile 6 and 12. Higher mean concentrations were measured from mile 6 to the mouth, with the greatest mean being 3.7 milligrams per liter in 1968 at mile 2.9. The DO concentrations in the Tamiami Canal violate the 4.0 milligram per liter standard.

Mean BOD concentrations in the canal indicate the waters are polluted. Again the mean BOD values in 1968 were greater than in 1969. The highest mean concentration found was 4.4 milligrams per liter in 1969, just downstream from the two waste discharges.

In 1969 the mean total coliform densities at 4 of the 8 stations sampled violated the 1,000 MPN per 100 ml. standard. The highest mean density in 1969 occurred downstream of the sewage treatment plants near the mouth of the canal and was 31,000 MPN per 100 ml.

The Little River Canal is approximately 11 miles long and flows from the Miami Canal to Biscayne Bay, where it discharges through two channels just south of the 79th Street Causeway. A spillway at mile 0.8 regulates flow and prevents salt water intrusion.

In 1969 mean concentrations were all lower than in 1968, mean DO concentrations, and ranged from 1.8 milligrams per liter upstream of the dam to 0.9 milligrams per liter at mile 6.9. Mean DO concentrations throughout the canal violate the 4.0 milligrams per liter standard.

The FWQA study found a mean DO concentration of 6.1 milligrams per liter and a mean BOD concentration of 1.6 milligrams per liter near the mouth of the northern discharge canal of the Little River. In the southern discharge canal the DO was 6.0 milligrams and the mean BOD was 1.2 milligrams per liter. At mile 1.7 the mean DO was 3.1 milligrams per liter and the mean BOD was 1.8 milligrams per liter.

All mean bacteria densities in the Little River Canal violate the 1,000 MPN per 100 ml. water quality standard.

Snake Creek Canal.

Snake Creek Canal extends from Canal C-111 to the Oleta River. The reach from mile 12 to the mouth will be discussed in this section. A spillway is located near the mouth of the canal and two sewage treatment plants discharge their effluents directly into the canal. The Andover subdivision discharges 673,000 gallons per day of waste at mile 4.5 and the Riverdale Estates subdivision discharges 490,000 gallons per day at mile 7.3. Carol City subdivision and Myrtle Grove subdivision sewage treatment plants discharge 2.2 and 2.13 million gallons per day respectively into the Carol City Canal, which enters Snake Creek at mile 8.

Mean DO concentrations upstream of mile 4 ranged from 3.1 milligrams per liter in 1968 to 1.7 milligrams per liter in 1969. Downstream of mile 4 a high mean concentration of 5.1 milligrams per liter in 1968 was observed at mile 2.4 and a low mean of 2.3 milligrams per liter in 1969 was found at this station. In 1968, seven of the eleven sampling stations had DO concentrations below 4.0 milligrams per liter. In 1969 the mean at one station equaled the standard and it was violated at all others.

The highest mean BOD concentrations were 6.1 milligrams per liter in 1969 at mile 0.1 and 5.7 milligrams per liter in 1968 at mile 1.4.

A mean DO of 5.7 milligrams per liter and a mean BOD of 2.1 milligrams per liter were found at the mouth of Snake Creek Canal during the FWQA study. At mile 0.6 a mean DO of 6.6 milligrams per liter and BOD of 3.4 milligrams per liter were observed.

Total coliform bacteria densities were greater in 1968 than in 1969. In 1968 nine of the eleven sampling stations violated the 1,000 per 100 ml. standard and in 1969 eight stations were in excess of the standard.

The 2.7 mile reach of the Oleta River from Broward County line to U. S. Highway 1 is discussed in this report.

The Golden Isle subdivision sewage treatment plant discharges 485,000 gallons per day in this reach.

The mean DO concentrations at all stations were lower in 1969 than in 1968, and the BOD and the total coliform concentrations were generally higher in 1969 than in 1968. The effect of the sewage discharge is in evidence downstream of the sewage treatment plant. The DO concentration drops and the BOD and total coliform concentrations rise.

During the FWQA study, the mean DO concentration was 4.7 milligrams per liter and the mean BOD concentration was 1.7 milligrams per liter at mile 0.7.

The major canals in southern Dade County are in the lower Biscayne Bay drainage and include C-100, Black Creek, C-102, C-103, otherwise known as Mowry Canal, Military Canal, and Florida City Canal. Water quality in these canals is relatively better than that in north Dade County. Drainage basins are less densely populated, and in the extreme southern end of the county land is used principally for agriculture.

Black Creek receives treated sewage effluent from two private utility company plants, South Miami Heights and South Coral Homes. A new plant serving the Goulds-Perrine area will also discharge into Black Creek near Hamlin Mill Drive. Black Creek discharges directly into the Biscayne National Monument at its northern boundary. Dissolved oxygen at the Old Cutler Road Bridge averaged 4.3 milligrams per liter in 1968 and 2.5 in 1969. BOD increased from 3.3 milligrams per liter in 1968 to 4.7 in 1969. Coliform densities averaged 32,950 MPN per 100 ml. in 1968 and 56,141 MPN per 100 ml. in 1969. These coliform concentrations as well as the DO concentrations in some instances are in violation of the standards.

FWQA data indicates relatively high nutrient levels: 1.12 milligrams per liter of phosphate, 2.2 milligrams per liter of Kjeldahl nitrogen, 1.4 milligrams per liter of ammonia, and 0.26 milligrams per liter of nitrate. These levels of nutrients, particularly the ammonia and nitrate, are indicative of a highly putrescible organic waste such as sewage.

Below the salinity barrier at levee L-31E in the tidal portion of Black Creek Canal the DO averaged 4.3 milligrams per liter in 1968 and 3.1 milligrams per liter in 1969. Coliform bacteria concentrations were also higher in 1969 than in 1968, with values of 23,111 and 5,583 MPN per 100 ml. respectively.

Goulds Canal is a short straight ditch along Coconut Palm Drive from about 120th Avenue to the Bay. It has no known direct sewage discharges. However, DO at one station shows a substantial decrease from 5.4 milligrams in 1968 to

2.6 milligrams in 1969. FWQA data indicate an unusually high nitrate concentration of 3.28 milligrams per liter while other nutrients, including phosphates and ammonia, are quite low. This is indicative of a highly nitrified discharge reaching the waterway, perhaps through subsurface seepage.

Military Canal has been subject to several fish kills in recent years. Improperly treated sewage effluent from Homestead Air Force Base and at least one instance of raw sewage by-passed directly to the canal has been blamed for these kills. DO averaged 5.1 milligrams per liter in 1968 and 1.8 milligrams per liter in 1969. Occasions of zero dissolved oxygen have been observed. Twelve samples by FWQA shows an average BOD of 15.1 milligrams per liter, 2.5 milligrams per liter of phosphates, 4.18 milligrams per liter of total organic nitrogen, and 2.91 milligrams per liter of ammonia nitrogen. All of these concentrations are indicative of severely polluted conditions and the 1969 DO concentrations are in violation of the Federal, State and local standards. Concentrations at the mouth of the canal, after dilution in the tidal waters of Biscayne Bay, are 4.2 milligrams per liter of BOD, 0.4 milligrams per liter of phosphates,0.41 milligrams per liter of ammonia. Military Canal discharges directly into the Biscayne National Monument.

Mowry Canal, otherwise known as C-103, is well covered by the Dade County monitoring program, although many of the stations have only one year of data available at this time. That is the 1969 data. Dissolved oxygen levels were quite low, ranging from 2.0 milligrams per liter to 4.3 milligrams per liter. BOD levels are correspondingly high, ranging up to 20 milligrams per liter. North Canal, which connects to Mowry Canal to form a combined discharge, receives sewage effluent from the city of Homestead plant. Dade County data show DO averages about 3.0 milligrams per liter and BOD averages above 4.0 milligrams per liter in that reach of the canal. Coliform bacteria densities averaged 6,123 MPN per 100 ml. in 1969, down markedly from the average of over a million reported in 1968. The combined flow of Mowry and North Canal flows into the Biscayne National Monument some two miles north of Turkey Point. Both dissolved oxygen and coliform levels are in violation of the Federal, State and local standards.

Finally, Florida City Canal originates at Highway 1 and flows eastward to Biscayne Bay. Four sampling stations on this canal indicate that dissolved oxygen averaged less than 2.6 milligrams per liter in 1969 and that it was lower in 1969 than in 1968. There are no known sewage effluent discharges into Florida City Canal.

There is very little water quality data available for upper Biscayne Bay and no data available for the middle bay. Near the Venetian Causeway mean DO concentration was 8.4 milligrams per liter and the mean BOD was 1.9. In Government Cut the mean DO was 7.1 milligrams per liter and the BOD was 1.3 near the inlet. Near the Miami end of the cut, the DO averaged 7.6 and the BOD was 2.0 milligrams per liter. At Rickenbacker Causeway an average DO of 7.4 and a mean BOD of 2.0 milligrams per liter were observed. Between Virginia Key and Key Biscayne the mean DO was 7.4 milligrams per liter and the mean BOD was 1.7.

The quality and scope of the data presently available for the upper Biscayne Bay will not allow any conclusions regarding its water quality. Lower Biscayne Bay has been the object of extensive studies by FWQA and other agencies in the past several years. Data from all known sources indicate that with respect to chemical and bacteriological parameters normally associated with sewage or organic pollution the open water of lower Biscayne Bay is of extremely high quality.

The only water quality data available for the Atlantic Ocean were collected by the Dade County Health Department as part of its routine bacterial surveillance program of Miami Beach and by the Dade County Pollution Control Department during a study of the Miami Beach ocean outfall.

Samples of total coliform analyses were collected from the surf on a monthly basis at 20 sampling stations from the Miami Beach Pier in the south to the Golden Beach in the north. The highest median total coliform bacteria densities observed in 1968 was 48 MPN per 100 ml. at 96th Street. The median densities in 1969 were all lower than those in 1968, with a high median of 8.5 MPN per 100 ml. In 1969 the months of January and February had the highest bacterial densities. The maximum density in January was 920 MPN at 31st Street. No densities quite as high were observed in February and the median density for the entire surveillance area was only 79 MPN per 100 ml. during both months.

On July 28, 1968, a special study of the effluent point of the Miami Beach ocean outfall was performed by Dade County Pollution Control. For those of you locally, that is known as the Rose Bowl. Total coliform bacteria densities at the four boils, 6,900 feet from the shore, ranged from 5.4 million to 54,000 MPN per 100 ml. at the surface. Four hundred fifty feet north of the outfall line surface concentrations ranged from 3.5 million to 330,000 MPN per 100 ml. and at the same distance south of the outfall the range of concentrations was 1.7 million to 79,000 MPNs. Additional data collected on

July 13, 1970, indicated that fecal coliform bacterial densities at the 74th Street pumping station were 16 million MPN per 100 ml.

There is a general paucity of data for the Atlantic Ocean off the lower east coast of Florida. No information was available with regard to water quality in the vicinity of North Miami or Virginia Key outfalls. Additional information pertaining to the effects of outfalls on the water quality and the biota of the open ocean receiving waters is needed.

Water quality data presented herein for the Coral Gables Waterway, Miami River, Snapper Creek Canal, Biscayne and Opa Locka Canals, Tamiami Canal, Little River Canal, and Snake Creek Canal indicate that the inland waters of northern Dade County are grossly polluted.

Dissolved oxygen concentrations of less than 4.0 milligrams per liter were found in all canals most of the time during both 1968 and 1969.

BOD generally varied inversely as dissolved oxygen, indicating that the decrease in DO is due to the decay of organic material rather than from any naturally occurring phenomenon.

Coliform bacteria densities exceeded the 1,000 MPN per 100 ml. standard in every canal during 1968 and 1969. These bacteria are indicative of sewage discharges.

Decreased DO and increased BOD concentrations and coliform bacterial densities correspond to known sources of municipal waste and further implicate these sources as the principal cause of deteriorated water quality.

The canals in southern Dade County which discharge into the Biscayne National Monument exhibit some water quality degradation from sewage effluent, although they are not as grossly polluted as the canals in the northern population centers of the county. Several instances have been noted in Black Creek and Military Canal in which water quality criteria are being violated. Also noted in most of the waters are high levels of nutrients, especially ammonia and nitrates and coliform bacterias,which may be indicative of subsurface seepage of septic tanks and from agricultural land runoff.

Insufficient data are available to draw conclusions regarding the water quality in upper and middle Biscayne Bay. Data reported elsewhere shows lower Biscayne Bay to be almost completely free of sewage and organic pollution based on its extremely high chemical and bacteriological water quality.

Very limited data on the open waters of the Atlantic Ocean show bacteriologically degraded conditions in the immediate vicinity of the municipal ocean outfalls. Coliform levels reported at inshore areas are generally below the established 1,000 per 100 ml. standard.

The ground, surface, estuarine and ocean waters in Dade County are interrelated. The canals recharge groundwater and receive water from the ground during dry periods, and they also discharge into Biscayne Bay while water from the bay is exchanged with ocean water and vice versa. Therefore, if the water quality of the canals is to be allowed to deteriorate further, especially in the northern portions of the county, or even to remain the same, serious problems will occur throughout the water system. One potential problem is the pollution of groundwater, which is the water supply for Dade County. The Hialeah-Miami Springs well field is located within 3,000 feet of the acutely polluted Miami Canal and the southwest Dade well field is within a mile of Snapper Creek Canal. Groundwater levels in the well field already are highly dependent upon recharge from these canals. Eventually groundwater in these areas may become so polluted that it cannot be used as a safe water supply even after conventional water treatment.

Another problem could occur if water from the canals is backpumped into the conservation areas. Such a proposal is being considered by the U. S. Army Corps of Engineers and the Central and Southern Florida Flood Control

District. At present there is no information readily available regarding the condition of the regions that could receive this backpumped water. This information, together with the operation plan for the flow regulating devices on the canals, must be known and made available before their effects on water quality can be assessed.

The establishment of the Biscayne National Monument in lower Biscayne Bay will require the continued preservation of the existing high quality of its waters. Present and especially future waste discharges to Lower Bay and its tributaries must be strictly controlled. To this end, consideration should be given to the complete removal of all waste effluents from this area.

The question of ocean outfalls has not been adequately investigated to allow for definite conclusions on their effects. The long-term effects in both estuarine and open waters has not been adequately measured, although available data indicate that these effects may be minimal. However, little, if any, consideration has been given to the effects of the discharge of these large amounts of freshwater to the ocean on the continued availability of freshwater in Dade County. With the projected population growth of the area to 2.7 million people, consideration must be given to not only protecting the water quality but also to reclaiming this water to assure a continued adequate supply.

Finally, a regional water quality management plan for the entire south Florida population corridor is needed. Such a plan would include considerations of advanced waste treatment, groundwater recharge, ocean outfalls, reclamation of water for recycling to the conservation areas, control of discharge of freshwater to the ocean, and the effects of future development in the upstate areas on the water quality and supply in southeast Florida.

I now go to the summary, conclusions, and recommendations, which are at the front of the record.

Dade County has experienced sustained population growth for 40 years. The present population of 1.6 million is expected to increase to 2.7 million within 50 years.

About 500,000 to 800,000 people in Dade County are served by individual septic tanks for the disposal of sewage and domestic wastes. There is also a large but undetermined number of households which use individual wells for their domestic water supply.

There are 113 separate sewage treatment facilities serving the remaining 1.1 million people.

Approximately 74 of these systems are small package treatment units which serve an estimated half million population.

There are 40 major sewage systems which serve 400,000 people. Thirty of these systems discharge treated effluent into the inland canal system. Four collection systems discharge through three ocean outfalls and two of these ocean outfall systems have no significant treatment prior to discharge.

At least eight treatment plants are known to be hydraulically overloaded, although performance data on all plants are not available.

The hydrology of Dade County is such that contaminated waters from the inland canal system of the Central and Southern Florida Flood Control District could adversely affect the quality of the groundwater which is the source of all municipal water supply in the county.

The ground, surface, estuarine and ocean waters in Dade County are interrelated. The canals recharge ground water and receive water from the ground during dry periods. They also discharge into Biscayne Bay, while the water from the bay is exchanged with the ocean and vice versa.

Inland canal systems in northern Dade County have dissolved oxygen concentrations less than 4.0 milligrams per liter and total coliform bacteria greatly in excess of 1,000 MPN per 100 ml. Degraded water quality is generally associated with known discharges of municipal wastes. Degradation of water quality increased from 1968 to 1969.

Canal systems in southern Dade County are generally not as severely polluted as those in the north. Two exceptions are Black Creek and Military Canals,which discharge severely polluted water into the Biscayne National Monument.

Water quality in the open waters of lower Biscayne Bay is excellent.

Coliform bacterial densities near the ocean outfall of the city of Miami Beach are extremely high, ranging up to 5,400,000 MPN per 100 ml. Coliform densities in the surf along Miami Beach occasionally exceed the 1,000 MPN per 100 ml. required for recreational waters by the State of Florida.

It is concluded that:

1. Septic tanks widely used in Dade County are a public health hazard and contribute to over-fertilization and algal nuisances in adjacent waterways.

2. The small package treatment units constitute a potentially significant source of organic and bacterial pollution.

3. The present methods for disposal through ocean outfalls without treatment require modification because of public health hazards and the detrimental effects on water

quality.

4. The inland waters of northern Dade County are grossly polluted and are in violation of the Dade County and the federally-adopted State of Florida water quality standards.

5. The inland waters of southern Dade County are showing signs of severe water pollution as evidenced by fish kills in the area.

6. The major cause of poor water quality in Dade County is inadequately treated municipal sewage effluent.

7. Further study is needed to determine:

A. Water Quality of central and upper Biscayne Bay.

B. The interrelationship between the canal system and the ground water and between the canal system and the estuarine and coastal waters.

To abate the existing gross pollution of the inland waters of Dade County and to provide a basis for the enhancement and management of future water quality of all the waters in the area, the following actions are recommended:

1. Completion of an up-to-date inventory of waste sources in Dade County with an evaluation of the performance of each of the 40 major treatment plants by April 1, 1971.

2. Immediate upgrading of existing treatment plant performance through improved operations.

3. Abatement of all wastes being discharged to the inland canal system of Dade County by January 1, 1973, which date is the target date set by the Florida Air and Water Pollution Control Board and adopted by the Secretary of the Interior for compliance with approved water quality standards. All existing sewage systems should be regionalized into a county-wide system of central collection and treatment facilities with disposal of treated effluents to the ocean. Secondary treatment must be provided for municipal wastes as required by the State of Florida before discharge to the ocean.

4. Inclusion in a county-wide collection and treatment system of all areas presently served by individual septic tanks. Approved plans for sewage collection systems for these areas should be prepared by August 1, 1971, and coordinated with design and construction of the adequate sewage treatment facilities previously recommended. No permits should be granted for future construction of septic tank systems.

5. No future additional waste discharges to Lower Biscayne Bay and its tributaries, including the Biscayne National Monument. Removal of existing municipal and industrial waste discharges should be considered for protection of the present high quality of these bay waters.

6. Review of the operations of the Central and

Southern Florida Flood Control District to determine its effect upon the water quality of the inland canal system and the receiving estuarine waters.

7. Development of a regional water management plan, including quality and quantity, for the entire southeast Florida population corridor. Such a plan must be developed jointly by all local, State and Federal interests and should include considerations of advanced waste treatment, groundwater recharge, wastewater reclamation, control of freshwater discharge to the estuarine and ocean waters, and the effects of future developments on the water quality and supply of southeast Florida.

Mr. Stein, that concludes the presentation of the Federal report. (Applause.)

MR. STEIN: Thank you, Mr. Hagan, for a very comprehensive report.

Are there any comments from the conferees?

MR. THOMAN: Yes, John, congratulations on the fine horror story of major scope. It sounds to me what you are describing is that south Florida is a big sponge, the situation can only get worse if something isn't done about it and that there is a distinct possibility that Miami will soon be drinking its own sewage whether it likes it or not.

MR. HAGAN: I would agree.

MR. STEIN: Well, in listening to this account, and on the assumption that this is substantially correct, we haven't heard from the other people yet, at least what is recounted here makes me consider what I think we generally don't like to do and that is the comparative situation in Dade County and other major cities.

People always ask which of the cities you look at for pollution problems, and my answer to that is that the big leagues, both baseball and football, have done that for us. If some city has a big league football team or a baseball team, they have a big league pollution problem. And I think that is a fair judgment of what the cities are doing.

I saw my own hometown team on television last night and they didn't do too well, but I think the Miami Dolphins are doing fine.

But let's look at this from the cities both in the baseball big leagues and the football big leagues, and I have been running these over in my mind as Mr. Hagan was speaking. I can think of only one that has the dubious distinction of probably providing less treatment than you do here. Just think of that. Second from the bottom. I may be wrong in that, but I don't think so. And if this is the case, I think we had better look at that.

Also the city which I think may be below you has a tremendous watercourse flowing by it and the wastes don't just sit around in relatively sluggish inland canals. It gets away.

FROM THE AUDIENCE: Which city is that, Mr. Stein?

MR. STEIN: Speak to me afterwards. I am not speaking about that for the record. It is no secret.

The other point that I think I would like to say is I thought we were better along with the identification. Actually I didn't think we were this far behind. In an early novel of George Orwell, who wrote Nineteen Eighty-four, I believe it was in Burmese Days, he said, "Blessed are those with identifiable diseases." And I thought that perhaps the problem we had here, because we know how to handle these wastes, was identifiable.

But if the paucity of data that you have indicated, Mr. Hagan, is the situation, I think we are a long way from a solution, because you are not going to clean up any wastes if you just know generally where those wastes come from. You have to identify every source, both as to volume and strength of wastes, with particularity if we are to get it.

I have one question of you, Mr. Hagan.

You mentioned the possibility of the depletion of the freshwater resource in southern Florida by just taking all these wastes, treating them and putting them into the ocean, and yet on Conclusion No. 3 or Recommendation No. 3 you say, All existing sewage plants should be regionalized into a county-wide system of central collection and treatment facilities with disposal of treated effluents into the ocean.

The question that I raise is how does that jibe with the other conclusion or can we afford that kind of luxury in southern Florida? I just ask the question.

MR. HAGAN: Yes, sir, I welcome the opportunity to speak to that point.

MR. STEIN: Right.

MR. HAGAN: Recommendation 7, if you will recall, is that a master plan be devised for all of south Florida, and we envision not only the south Florida population corridor of Dade, Broward and Palm Beach Counties, but the entire drainage basin from Lake Okeechobee on down from whence this area gets most of its surface water.

The long-range planning should include, among other things, considerations of groundwater recharge and wastewater reclamation for the purpose of conservation of the freshwater resource. The gross pollution which is presently evident in the canals in Dade County makes it mandatory that we invoke the basic principle of epidemiology, which is to separate the possible disease receptor from the disease organism as far and as quickly as possible. In terms of economy, although I don't have the actual dollar figures, I would estimate that what we have proposed in Recommendation 3 is the cheapest and quickest way to get the gross pollution out of the canals and as far removed from the population of Dade County as possible.

Then once we have regionalized collection systems, we have a large network of pipes in the ground from which we can withdraw quantities of sewage, provide treatment to a very high degree for the purpose of reclamation, and then use that reclaimed water for our discharge to the ground or to the conservation areas.

In any case, in a metropolitan area of this size, and with the high use of the waters for recreation and body contact, we can't really afford the luxury of a mechanical malfunction of a tremendous sewage treatment plant sitting back on one of these canals. If something goes wrong and you have to bypass into the canal system, then you wipe out the canal immediately.

Therefore, in any case, the ocean outfall acts as a safety valve to allow us to make some--we have some slack then to allow for mechanical malfunctions and the normal operational difficulties that always occur.

MR. STEIN: Let's see if I understand that. In other words, you are suggesting disposal of treated outfalls to the ocean as the fastest first step toward this--

MR. HAGAN: That is correct.

MR. STEIN: --the notion at this time. You are proposing, too, that at some later time we consider using water, certainly without high salinity, for recharging of your fresh-water supply, but saying that the ocean outfalls in any event will not be a wasted investment--

MR. HAGAN: That is right.

MR. STEIN: -because we would need those as a safety valve or disposal device in case of a malfunction of the reclamation system inside?

MR. HAGAN: That is true. And in any case, the ocean outfalls for the disposal of the bulk, really the bulk of the sewage.

MR. THOMAN: One of the other problems here, Mr. Stein, is the fact that while you are throwing away a valuable resource used in the conservation areas or possibly for ground-water recharge, due to the hydrologic conditions you probably don't have a product with a 100 percent demand for it because of the rainfall, and during the periods when you don't have that, you are going to have to put it some place and, as Mr. Hagan so admirably described, get it as far away as we possibly can from the use sources.

MR. STEIN: Are there any other comments or questions?

If not, thank you very much again, Mr. Hagan.

I think we are going to try to go through, if we are going to complete this, until about 12 o'clock anyway.

Mr. Thoman.

MR. THOMAN: I have a statement here from the Southeast Field Representative of the Secretary of the Interior, Mr. Clarence Lorentzon. He was unable to be here and asked if I would read his statement.

(Which statement was read as follows:)

STATEMENT OF CLARENCE LORENTZON
SOUTHEAST FIELD REPRESENTATIVE FOR
SECRETARY HICKEL, U.S. DEPARTMENT OF THE INTERIOR

As Secretary Hickel's representative in the southeast region, I know that he applauds the action of Governor Kirk and the Florida Air & Water Pollution Control Board in asking for a pollution abatement conference, administered by the Federal Water Quality Administration, to determine the pollution abatement requirements for Dade County.

Recently, it has been my responsibility to represent those agencies of the Department of the Interior which have wide

C. Lorentzon

ranging responsibilities in assuring a quality environment for the people of south Florida and Dade County. In this capacity I have appeared before the Dade County Commission to highlight some of the problems which those agencies face and to ask that the considerable knowledge which they possess be utilized by county planners in the drafting of a county-wide master development plan. This plan will not only assure an improvement in the water quality of the region, but will protect many of the vital aquatic resources upon which Florida, the leading tourist State of the Nation, depends.

This conference deals with the loss in the water quality due to pollution and the ways to restore that water quality to acceptable levels. This has the highest priority, because many of the major environmental problems facing the people of Dade County relate to this problem. For example, it will play an important role in supplementing the dwindling freshwater supply. When freshwater in sufficient quantities is available, salt water intrusion is lessened. With the provision of adequate regional sewage treatment, a broader environmental base will be established upon which planners may project a reasonable growth for housing, parks, and recreational areas. Certainly the preservation of the pristine waters of South Biscayne Bay are absolutely vital to the existence of Biscayne

National Monument. And, finally, the preservation of the mangroves and other natural features, important in the food chain for Florida's abundant fisheries, would be assured.

Recently aggressive moves by developers to create high-density residential and industrial areas adjacent to Everglades National Park clearly illustrates an imminent danger to one of south Florida's most unique assets. Everglades National Park has played a vital role in the development of south Florida as one of the world's greatest tourist areas. It plays another vital role in the preservation of a large portion of south Florida's commercial and sports fisheries. If Everglades National Park is to survive, an assured supply of high quality water is necessary, and a large part of this water comes from Dade County.

The National Park Service has expressed concern regarding the quality of the water being received. Volume alone is not enough. The water must also be of such quality as to preserve the various aquatic environments in the park. Therefore, it is recommended that measures be taken now and in the future to assure that water delivered to the park will not cause ecological damage or deterioration in the park environment.

I feel certain the information developed at this conference will go a long way in alerting the people of this

State as to the nature of the pollution problem facing them in this area. And it should dramatize the need for master planning so as to prepare Dade County to face the problems of growth in the future with confidence and full expectation that a quality environment can be preserved and the quality of life enhanced for all who live here.

Thank you. That concludes the statement. (Applause.)

MR. STEIN: Thank you, Mr. Thoman.

Will you continue with the Federal presentation?

MR. THOMAN: Yes.

We have representatives of several Federal agencies here: from the Department of the Interior Mr. Gibbs, who is Project Coordinator in the area, Mr. Buchanan from U. S. G. S., Mr. Sherwood from U. S. G. S., Mr. Nix from the National Park Service, Commander Istock from the U. S. Coast Guard and Mr. Wright from the U. S. Coast Guard, Mr. Wyatt from the Homestead Air Force Base, and Mr. Bird, who is the Regional Economist for the Federal Power Commission in Atlanta.

None of them have indicated any intention of presenting a statement.

MR. STEIN: Would you give those cards to the secretary? Because I think we need the first names on those.

MR. THOMAN: Right, we will.

Col. A. S. Fullerton

At this time I would like to call on Col. A. S. Fullerton, who is the District Engineer, Jacksonville District, Corps of Engineers.

Colonel.

COL. A. S. FULLERTON
JACKSONVILLE DISTRICT ENGINEER
CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

COL. FULLERTON: The Corps of Engineers welcomes the increased emphasis being placed on water pollution control measures. We are vitally interested in the subject as an agency charged with certain statutory responsibilities for the protection and preservation of navigable waters and as an agency involved in water resource programs.

The River and Harbor Act of 1899 contains a number of provisions which operate to give the Department of the Army and the Corps of Engineers considerable control over activities affecting navigable waters of the United States. Section 10 of that Act prohibits the erection of structures or the undertaking of work in navigable waters except on plans recommended by the Chief of Engineers and authorized by the Secretary of the Army and provides the basis for the permit program currently administered by the Department of the Army through the Corps of Engineers.

Section 13 of the 1899 Act is commonly referred to as the Refuse Act. Section 13 prohibits the discharge of matter of any kind, whether from ship or from shore, into the navigable waters of the United States unless flowing from streets or sewers in a liquid state.

And with respect to flow from sewers, this means sewage, which, of course, is what we have principally been talking about here.

The somewhat limited authorities contained in this old statute have been materially enlarged in recent years by passage of the Fish and Wildlife Coordination Act of 1958, the Water Pollution Control Act, as amended, with further implementation thereof through Executive Order No. 11507, and the National Environmental Policy Act of 1969. And finally we have the recent Water Quality Improvement Act of 1970, and Section 21 of that Act amends PL 84-660, and under Section 21 of that Act the Corps of Engineers no longer accepts permit applications for dredging, filling, outfall canals and construction of commercial piers, marinas, outfall lines or structures, and any pier or platform on which any type of industrial or commercial plant is proposed until the application is accompanied by certifications from the State pollution control agency or the FWQA. And, of course, in Florida the pollution control agency is the Department of Air and Water Pollution Control. This certification provides the Corps of Engineers with reasonable assurance that the proposed activity will not violate applicable water quality standards.

In the processing of a permit application for work to be performed in the navigable waters, the Corps of Engineers seeks the comments of interested State and local authorities as well as those of the general public. If State or local laws require a license or approval from a properly constituted agency, it is the policy of the Corps to decline to issue a permit even if the work is otherwise unobjectionable unless such State and local approval has been secured.

Applications are carefully coordinated with the several agencies of the Department of the Interior in accordance with a memorandum of understanding entered into by the Secretary of the Interior and the Secretary of the Army in July of 1967. Through this procedure we are assured that very careful attention is given to any position taken by the Department of the Interior agencies before final action is taken. Where adverse effects are indicated, an applicant is given the opportunity to reduce such effects or to revise his plans so that the effects may be minimized or eliminated entirely.

The final decision of the Department of the Army cannot be made until after evaluation of all relevant factors, including the effect of the proposed work on navigation, fish and wildlife, conservation, water quality, aesthetics, ecology, and the general public interest. You may be interested to know that our right to deny a permit for reasons other than navigation has been upheld in the Federal courts.

Although the Refuse Act has been used for many years to prosecute those responsible for discharges or deposits which adversely affect the navigable capacity of a waterway, its utilization in connection with discharges or deposits having an adverse impact on water quality has been comparatively recent. This is not surprising, since water pollution was not the serious problem in 1899 that it is today.

The preservation of the navigable capacity of our Nation's waterways was perhaps uppermost in the minds of the legislature and the Congress 70 years ago. Viewed in this light, the uncertainties associated with utilization of the Refuse Act for purposes unrelated to navigation are more readily understood.

In more recent years, court cases clearly hold that the Refuse Act may be used independently of other legal authority to prevent, through injunction, illegal deposits in navigable waters or to prosecute those responsible for discharges or deposits which have an adverse impact on water quality even though such discharge or deposits may have no impact on the navigability of a waterway.

In July 1970 the Corps of Engineers announced a new policy to enforce the so-called Refuse Act against those discharging into navigable waters by requiring permits for such activity. While we publicly announced the new permit requirement, definitive procedures, including the application of permit forms, have not yet been published.

The Department of the Army is currently developing the Refuse Act program in coordination with the Environmental Quality Council and other agencies, such as the FWQA, which are necessarily concerned with the relationship of our proposed permit program to their programs, particularly in the water quality area. The Department of the Army is in the process of drafting interagency agreements and regulations and identifying procedures for the processing of the large number of permit applications that are anticipated.

Although we recognize the need for the program and believe it should be made applicable as soon as possible to all who are discharging or who propose to discharge into navigable waters, we may, because of limited resources, have to develop an initial system of priorities to match workloads to available personnel and funds. For example, we might give more attention to proposed discharges from new facilities and to discharges of hazardous substances which may pose a significant danger to man or the environment.

We work closely with all appropriate agencies in an effort to reduce or eliminate pollution. In dredging operations this presents a problem of considerable proportions. Our entire system of spoil disposal is under constant review. Several months ago we participated in a conference held in Atlanta with the FWQA officials and have since carried on correspondence with that agency in an effort to establish spoil area control standards which will achieve our mutual aims.

In administering both permit work and our own work in the field, the Corps depends on State and Federal pollution control agencies for assistance in the following areas:

1) Gathering of water quality data and providing technical advice on possible effects, both adverse and beneficial, on water quality by works constructed under Department of the Army permits.

2) Procurement of proof of violations of regulations and/or quality standards by a permittee and presentation of that

proof to the Corps if corrective measures are indicated.

3) Provision of advice and technical assistance as to how a permittee's project or a Corps of Engineers' project might be modified in construction and/or operation to maintain or enhance water quality.

The Corps of Engineers appreciates the opportunity to present at this conference today this statement, and you may be assured of our full and active cooperation in the field of pollution control and particularly as it relates to Dade County.

Do you have any questions, Mr. Chairman?

MR. THOMAN: Thank you very much, Colonel.

MR. STEIN: Are there any comments or questions?

MR. REED: I would like just to say, Mr. Stein, for the record, that we have enjoyed a relationship with Col. Fullerton and the District Office in Jacksonville that is not excelled.

We are very appreciative of the continuing joint efforts, Colonel. I think we could take a hard joint look at some of the problems in Miami River and the outfalls together as the new permit regulations come about.

COL. FULLERTON: Right. You may be interested to know, and this relates to Mr. Thoman's reading of Mr. Lorentzon's letter, that we are undergoing and have just started a study at

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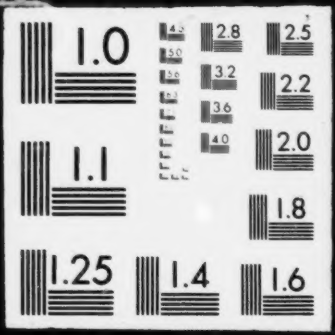
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the behest of the Senate concerned with the water quality supply to the park, and this will be reported on in the spring, but it is being carried on. And there is considerable information available, principally in the hands of the USGS. I see they are here, however.

MR. STEIN: I am sorry, we are not taking comments from the floor. You will be given an opportunity to speak when the time comes. If we did, my boss would be very irritated because I would be in this lovely spot for the next month.

Thank you very much.

MR. THOMAN: Thank you very much, Colonel.

Are there any other representatives of Federal agencies who wish to make a statement?

Mr. Gibbs or Mr. Nix?

If not, that will conclude the Federal presentations.

MR. STEIN: We will call on the State of Florida now.

Mr. Reed.

NATHANIEL P. REED, CHAIRMAN
DEPARTMENT OF AIR AND WATER POLLUTION CONTROL
STATE OF FLORIDA, TALLAHASSEE, FLORIDA

MR. REED: Mr. Stein, on March 10, 11 and 12 the Department conducted public hearings in Palm Beach, Broward and Dade Counties to publicly examine the growing pollution problems of this entire southeast area. I was deeply concerned at the results of the hearings. There was immediate contact with the distinguished Dr. Bax, Secretary of the Department of Health and Rehabilitative Services.

We flew to see the Governor in Lakeland, Florida, on the 17th and he authorized Dr. Bax to begin a prompt investigation from the health aspects of what our report had shown was a growing pollution problem. Dr. Bax is here to report about his efforts in this field and the very excellent work that he is doing.

Dr. Bax.

DR. JAMES A. BAX, SECRETARY
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES
STATE OF FLORIDA

DR. BAX: My name is James A. Bax. I am Secretary of Health and Rehabilitative Services for the State of Florida.

One of our primary responsibilities in the Department of Health and Rehabilitative Services is the protection of the public health of every citizen in Florida and also the 20 million tourists who come to our State each year.

On April 24 I appointed a special committee to investigate environmental problems in three of the State's largest counties. It had become apparent to us that conditions in Dade, Broward and Palm Beach Counties had almost reached an environmental crisis stage. The primary members of that committee were:

Dr. Mark Hollis, from the World Health Organization, who served as Chairman of the committee.

Dr. William Stenger, Regional Medical Consultant for south Florida and formerly the county health officer of Dade County.

Phillip Searcy, Director of the Environmental Health Division of the Broward County Health Department.

Vince Patton, Executive Director of the Florida Department of Air and Water Pollution.

And Sidney Berkowitz, Chief of the Division of Health, Bureau of Sanitary Engineering.

I am going to read to you the summary of their remarks.

The world over, man's environment is being subjected to unprecedented forces--explosive growths of population and industry, increasing urbanization, accelerating technological advances. These forces are clearly discernible in the tri-county area of Dade, Broward, and Palm Beach Counties, where expanding tourism and natural recreational values add greater dimensions to problems of environmental quality. The speed, magnitude, and complexity of these forces intensify existing problems in the man-environment relationships. At the same time, they create a host of new problems, many of which cannot be defined or understood by traditional indices and parameters. Thus the gap widens between what we do and do not know about the implications of these rapid environmental changes on human health and well being. Better to assess these changes, it would be prudent for regulatory agencies responsible for environmental controls to reshape and sharpen their analytical methodologies. Moreover, such agencies should initiate more effective monitoring of the environment. This will enable them to bring scientific understanding to their problems; project trends; organize and take necessary corrective actions.

The disturbing fact is that water, land, and air resources are already being severely overtaxed with pollution. This is abundantly clear--even with present methods of measurement. It is also clear that present corrective and remedial measures are grossly inadequate and grossly ineffective. While the present situation may be correctly considered as an "environmental crisis," a projection of current rates of problem development and environmental degradation foreshadows conditions of catastrophic proportions in the 1970's. The challenge is clear--the time is short--but the technological capabilities are available to cope with the situation.

It is against this background that the committee held its sessions. The primary objective of the committee was to assess the extent of the environmental crisis. In view of the time factor, this assessment had to be determined largely on the basis of the composite professional judgment of the committee's members.

The tri-county area contains one-third of Florida's population, annually entertaining visitors numbering many times its resident population. The mandate to the committee recommended primary focus upon the problems of physical environment other than those of air and water pollution, since the specific aspects of the latter had been only recently explored in public hearings. In deference to the three-day time factor, the committee agreed to holding five sessions in all: Two sessions primarily with officials concerned with environmental control (Attachment A); two sessions primarily with elected officials and consultants (Attachment B); and one executive session for committee deliberations and conclusions.

Based on the presented information, the following findings are, in the opinion of the committee, the most important:

I. General.

While the environmental crisis is not yet catastrophic, there is ample evidence that environmental degradation has reached alarming proportions. This is particularly true with regard to water-and-land pollution and to air pollution to a slightly lesser extent. In making this judgment, the committee emphasizes the overriding importance of environmental quality to the health and social values and to the economic development of the area.

II. Governmental or Institutional Structures.

The tri-county area constitutes a densely populated, urbanized complex, consisting of 89 incorporated municipalities and three county governments (Table 2). The area lacks uniformity of regulatory controls and is rapidly outgrowing the ability of existing governmental structures to respond to the environmental problems created. It came out repeatedly that there is an urgency to establish a unified effort, either by agreement among the several jurisdictions or by means of joint or regionally oriented institutions. The committee emphasizes that these complications will increase--not diminish.

III. Land Use.

Present land-use patterns are creating unmanageable jungles of people, high-rise structures, and uncontrollable wastes. It is important that both short-term objectives and long-range goals for growth be identified and rigid standards be established and religiously adhered to. It is essential that physical and social as well as economic-development factors be carefully assessed, avoiding past tendencies to give highly preferential consideration to the economic factor alone.

Present environmental deteriorations are directly related to official supports for the position of various special interests that the provision of necessary and adequate basic services are too costly. The committee stresses that failure to make such services mandatory will wreck the environmental-quality values in the area and will further complicate fiscal structures in local jurisdictions in their efforts to patch up and correct past omissions or deficiencies.

Without specific identification of need, it is essential that adequate land areas be reserved for public use, including, but not limited to, watershed protection, solid wastes disposal and utility sites.

The attainment of goals will require enforcement of stringent provisions, including those for the availability of urban utility services coincident with, or in advance of, actual housing construction. Temporary facilities have been demonstrated to be disastrous and must therefore not be relied upon, except in extremely well controlled situations where any resultant failure will not adversely affect the overall objective.

IV. The Septic Tank Problem.

In view of the complexity of environmental factors coupled with accelerating population growth, the widespread use of septic tanks throughout much of the high density, urban areas makes this an environmental crisis of serious proportions. Topography, soil conditions, and high water table make the use of septic tanks highly undesirable for most of this densely populated area. Wide-scale malfunctioning of septic tanks has been reported, which factor poses serious public health hazards and adds to surface and groundwater pollution, as well as to property devaluations. Two courses of action must be pursued simultaneously: Additional housing developments using septic tanks should be banned; and efforts to replace existing septic tanks with modern sewerage systems should be accelerated. With close to 250,000 septic tanks (Table 1) which presently dump about 85-million gallons of sewage per day into the area's soil and waters, continued delays can prove disastrous. Excessive maintenance of septic tank systems because of high failure rates results in a mammoth sludge pumpout disposal problem. Emergency measures are needed in order to provide safe disposal of septic tank sludge through adequate sewage treatment facilities.

V. The Solid Waste Problem.

Breakthroughs in the technology of solid waste collection and disposal cannot be awaited in this area. The crisis is already here. With the dynamic population growth (Broward County alone added 53,000 last year.) and an increasing per capita solid waste volume, the cost of keeping pace, even with highly unsatisfactory results in many cases, is great--and the cost of positive action in reducing existing environmental problems will be far greater. This is a cost which must be paid, however, because if action is not taken soon the ultimate cost to the people of the area--and to the State of Florida--will be staggering. With the great expense involved, economy of scale must be achieved to the maximum extent; such economy will require a consolidated cooperative effort. This is an area in which the cities--and perhaps even the counties--are unable to function as individual entities.

The committee strongly urges mandatory garbage and rubbish collection services. Individual or unauthorized garbage dumping practices create serious environmental hazards, not to mention aesthetic nuisances.

Several research needs are readily apparent from various presentations. Some of the most visible of these are concerned with the solid waste problem and include:

Better methods of collecting garbage and trash;

Control of packaging;

Disposal of plastics that are not compatible with good incinerator operation;

Possible replacement of non-degradable materials;

Development of processes to use waste materials that are presently being discarded.

VI. Regulatory or Control Implications.

Failure to manage the total environment in the complex urbanized community will be catastrophic; moreover,the margin for error is dangerously narrow.

Environmental control boundaries being neither fixed nor inflexible, the tri-county area must necessarily be considered as being intimately related to contiguous areas; also, local regulatory services will have to be integrated with, and supported by, State forces. Since an extremely high, non-resident and transient population is the basis for the tri-county area's major industry, this superimposes an additional and indispensable burden on efforts to fully implement and maintain controls which will be fully adequate and timely.

The committee finds that present environmental control forces are technically competent and cognizant of current needs. However, to achieve required results, increased enforcement activity must be supported, together with in-house capability for developing needed scientific analytical data.

Continuous overall effort evaluation should include intracounty staff conferences guided by regional consultant, and involving State agency participation on an adequate basis. Intracounty and intercounty communication between the several jurisdictions must be improved and maintained to avoid duplication of effort and to assure cooperative endeavors.

VII. Water Resources.

The sources of domestic water supplies for this urban complex are surface or shallow aquifers. Freshwater supply needs are already reaching astronomical figures. Among the experts appearing before the committee, disagreements were expressed as to the future adequacy of these sources, especially during extended periods of droughts. Obviously, assured quantities of freshwater are essential, and hence this problem needs appropriate study and scientific validation.

Beyond the matter of adequate freshwater, the top priority environmental problem in the tri-county area is municipal sewage and industrial waste. The provision of sewers and sewage treatment works is primarily the responsibility of local municipalities. With few exceptions, the systems are heavily overloaded; the discharged sewage effluents are grossly undertreated; and receiving waters are becoming more and more polluted, as was pointed out in the previous report. There is simply no question but that the estuarial and coastal waters are being degraded and in time that they will become dead areas in terms of fish-food chain and spawning grounds. This problem is in need of special attention.

It is quite obvious that all sewered wastes in the tri-county area should receive a high degree of treatment. Final disposal of these treated effluents is a matter of considerable importance. If discharged to land or estuarial waters, tertiary treatment is important as a means of reducing plant nutrients. If disposal is by ocean outfalls, the waste treatment works should be carefully designed and engineered to fit each specific outfall situation. Ocean disposal of wastes should be under rigid controls, with the effluents carefully monitored.

VIII. Enforcement.

The committee believes that immediate and continuing action be taken promptly at the county level, in each of the three counties, in cooperation with the Department of Health and Rehabilitative Services and the Department of Air and Water

Pollution Control, to initiate enforcement action to ensure compliance with existing environmental control regulations. Each county should immediately survey all sewage treatment plants, all incinerators, all landfills, and all water treatment plants, in order to determine their status of compliance. All facilities that are found to be deficient and not in compliance with existing regulations should be served a legal notice and order, preferably by the county program where authorized; or, where this is not appropriate, the information should be forwarded to the proper State agency for issue by said agency. Continuing surveillance is essential.

My brief critique of their report is that the consensus of these experts is a clear warning to the people and the officials of south Florida that unless they act promptly, decisively and above all in unison an environmental crisis of such proportions will be upon them in this century that the area may not be livable.

State government has been a partner in neglect of this problem, but it must be clear that the multiplicity of local agencies and government, local decision by indecision, growth-at-any-price-ism,and special interest favortism are chiefly responsible for the present situation. (Applause.)

(The attachments referred to follow:)

TABLE I

Estimate of Existing Septic Tank Installations

County	Number of Installations	Estimated Population Served*	Estimated Total Population‡
Dade	143,000	500,000	1,169,000
Broward	88,000	300,000	528,000
Palm Beach	13,500	47,250	312,000
TOTALS	244,500	847,250	2,009,000

*Based on 3 1/2 persons served by each septic tank system

‡Based on July 1969 estimates (unconfirmed estimates for Broward County exceed 600,000)

TABLE II

County	Number of Municipalities*	% Pop. In Municipalities*	% Pop. In Unincorporated Areas
Dade	27	72	28
Broward	31	63	37
Palm Beach	31	74	26
TOTAL	89		

*Municipalities refer to active incorporated cities and communities.

ATTACHMENT A

Sessions I and II - May 4, 1970 - Ft. Lauderdale

Broward County Health Department

Participants:

- Nathaniel P. Reed, Chairman, Department of Air and Water Pollution Control
- Frank Kleeman, Director, Broward County Water and Sewer Board
- Robert L. Quick, Sanitary Engineer Director, Dade County Health Department
- Norman L. Tuckett, Sanitary Engineer Director, Broward County Health Department
- L. W. Lukin, Director of Environmental Services, Palm Beach County Health Department
- Woodrow Smith, Engineer, Broward County Health Department
- Dr. William J. Fogarty, Director, Urban Studies Department, University of Miami
- John Welke, Regional Sanitation Consultant, Division of Health
- Lee Reed, Sanitation Consultant, Palm Beach County Health Department
- Charles Rhodes, Director of Sanitation, Palm Beach County Health Department
- Willard Galbreath, Director of Sanitation, Broward County Health Department
- Willis Hillyer, Engineering Services, Broward County Health Department

ATTACHMENT B

"ENVIRONMENTAL CRISIS COMMITTEE"

TENTATIVE AGENCY FOR THE PUBLIC HEARING TO BE HELD ON TUESDAY, MAY 5, AT THE AUDITORIUM OF THE DEPARTMENT OF TRANSPORTATION, 780 S.W. 24 ST., FT. LAUDERDALE, FLA.

9:00 a.m. — Discussion of the Problems of Collection and Disposal of Solid Wastes in the Lower Southeast Florida area.

Participants:

- Mr. John Greenlead, P.E., Greenleaf/Telesca, Consulting Engineers, Miami
- Mr. Duncan Britt, P.E., D.E. Britt & Assoc., Consulting Engineers, Ft. Lauderdale
- Mr. Richard L. Almeida, Director, Broward County Waste Disposal and Collection System
- Mr. Jack Lewis, Superintendent of Sanitation, City of Ft. Lauderdale
- Mr. Earl Eberlin, Director of Public Works City of Hollywood
- Mr. Don Carew, Superintendent Public Works, City of Lake Worth

11:00 a.m. — Discussion on Protection of Public Water Supplies

Participants:

- Mr. C. B. Sherwood, United States Geological Survey, Miami
- Mr. J. Stanley Weedon, P.E., Water Control Engineer, Broward County
- Mr. Ed Dail, Executive Director, Central and Southern Florida Flood Control District Authority, W. Palm Beach
- Mr. Rod Campbell, Director of Utilities, City of Ft. Lauderdale

12:30 to 2:00 p.m. — Noon Luncheon break

00 p.m.	Honorable David M. Lapham, Mayor of North Miami Beach Re: Septic Tanks
2:30 p.m.	A. W. Saarinen, Jr., P.E., President, Philpott, Ross & Saarinen, Consulting Engineers Re: State-wide equilization of sanitary sewer assessments
3:00 p.m.	Honorable Richard Calhoun, Mayor, City of Miramar Re: Conversion and enlargement of their wastewater treatment facilities
3:30 p.m.	Honorable Harvey Ruvin, Councilman, North Bay Village Re: Municipal ordinance adopted by North Bay Village relating to marine toilet facilities and marina water pollution.
4:00 p.m.	Appearances by Interested Citizens

MR. STEIN: Thank you, Dr. Bax, for an excellent statement.

Any comment or question?

Dr. Bax, I know a lot of people on that committee, the names you read, but particularly I want to call attention to the Chairman of the committee, Dr. Mark Hollis, who is with the World Health Organization now and used to be Assistant Surgeon General of the Public Health Service of the United States.

I have worked with Dr. Hollis and for Dr. Hollis for many years, and I know that he is a very careful and conservative man, particularly in professional judgments. And for him to come out with a report like that and be Chairman of that I think is significant in and of itself.

And I ask the other participants, if they have other views, they may want to consider this. When he says "temporary facilities"--which I take o be these package treatment plants--"in this area are disastrous: septic tanks are not appropriate," I know of no one, really, who has the experience not only in this country but throughout the world on temporary facilities and the effectiveness of that, or septic tanks, that Dr. Hollis has. Likewise, when he talks about sewage and sewage treatment, that the waters are being degraded and that in many cases you need tertiary treatment here, and that other point that I kind of arrived at myself on the status of compliance, he, of course, as Dr. Hollis always likes to do, put this on the local authorities that they have to check it.

But if these reports hold up on the kind of compliance you have, I should indicate to all that the Federal Government may be involved in this on the status of compliance and if this is not done locally or through the State level, we are going to be here.

DR. BAX: I might add that Mark Hollis will be a Florida resident in 1971 and we are going to put him to work for us, probably in this 3-county area.

MR. STEIN: Oh, wonderful. Wonderful.

MR. THOMAN: Dr. Bax, may I ask you one question for the benefit of the conferees.

Do you feel that the conferees should take into consideration as part of their conference summary and report and recommendations the recommendation that there be an imposition of a ban or a temporary ban or a temporary cessation of the issuance of septic tank permits?

DR. BAX: I have been attempting to stamp out septic tanks, and it is kind of a ticklish task, for about the last six months. But the first draft of very stringent septic tank regulations has been drafted; it is awaiting public hearing, and then when I sign it, it becomes a regulation for the State of Florida that will be in force throughout the State. We are getting a great deal of discussion, to say the least, because these regulations will be an effective deterrent to the great misuse and misapplication of septic tanks in the past.

But we will, of course, appreciate any input that your conferees may provide to us.

MR. THOMAN: I would hope that the regulations would include some sort of a provision that permitted them to be used only on a temporary basis until sewage could be constructed through the area.

DR. BAX: Mr. Sidney Berkowitz is here with me, who is the Chief of our Bureau of Sanitary Engineering, and I am sure he is going to attend the conference and will incorporate any of these recommendations into our drafted regulations.

MR. THOMAN: My good friend Mr. Berkowitz has been fighting septic tanks for the 20 years that I have known him.

DR. BAX: He has some support now.

MR. THOMAN: Thank you, sir.

MR. STEIN: Are there any other comments or questions? If not, we will recess for lunch now until 1:30.

(NOON RECESS)

AFTERNOON SESSION

Tuesday, October 20, 1970

(1:30 o'clock)

MR. STEIN: Let's reconvene.

Mr. Reed, will you continue with Florida's presentation.

MR. REED: Our next presentation will be by Mr. Vincent Patton, Director of the Department of Air and Water Pollution Control, the statement for the Department.

VINCENT D. PATTON
EXECUTIVE DIRECTOR, DEPARTMENT OF
AIR AND WATER POLLUTION CONTROL
STATE OF FLORIDA, TALLAHASSEE, FLORIDA

MR. PATTON: Thank you, Mr. Reed.

Mr. Chairman, fellow conferees.

The preliminary 1970 census count places Dade County as the major metropolitan area of Florida with 1,260,000 persons, twice as many as the next most populous county. Although this represents only a 35 percent increase in population since the 1960 census (Broward had 83 percent and Palm Beach County 51 percent increase),numerically it was 324,000 people, more than any other county. That is, Dade County has continued to grow at a rate of about 90 persons per day. Using

V. D. Patton

conservative design figures, this is another 10,000 gallons per day of wastewater from the residences of these people, not considering the additional waterborne wastes from the expansion of services and businesses serving the needs of these additional residents. A similar parallel can be drawn for the tourist industry. One needs only to compare the Dade County skyline of 1960 with that of today to get some idea of the tourist and business expansion. People come to south Florida, attracted by the pleasant climate and the natural attractions of ocean beach, waterway and lakes and the open spaces. Tourism is the major industry in Dade County.

Thus, Dade County, as the major growth county of Florida, should be the county with the fastest growing facilities to serve this population; Dade County should be an example of constructive progress to cope with this growth. That this growth has placed tremendous pressure on the resources of Dade governments for many services is well realized. Today, however, we are concerned with sanitary sewerage, a service that is imperative to protect the environment which has attracted people to south Florida.

What has Dade County done in the 10 years or so since the preparation by consulting engineers of the Metropolitan Dade County Master Plan for Sanitary Sewerage prepared for the Board of County Commissioners of Metropolitan Dade County in November 1961 other than add more septic tanks and package plants? Much of the work recommended in that report should be in place or well along toward realization. In actual practice, efforts to do something about constructing sanitary sewerage facilities has taken place only during the past few years--only since the county manager established the office of water and sewer programs.

This program is commendable in that works have been placed under construction through some very ardent and effective manipulating to obtain the maximum mileage from available Federal funds with minimum input of county funds, but it has not had a systematic, regularly financed effort of constructing sewerage facilities. Metropolitan Dade County when it was created in 1957 was considered to be the way to achieve unified county-wide community services, of which the sanitary sewerage system is one.

Progress has been disappointing. There appears to be a lack of cooperation between the county and the cities necessary to achieve a county-wide sewerage system. A study this year by the Water and Sewers Action Committee of the Greater Miami Chamber of Commerce revealed the rivalry between government was typical of the rather inadequate efforts to utilize the total combined community resources in establishing a unified system. The recent action by the Metro government at the time of the bond election of the city of North Miami Beach for the construction of sewerage facilities is a case in point.

Although the County has participated in some cooperative programs with municipalities, considerable friction exists between the county and municipalities when the projects are in areas which the county feels it may serve at some future date. The same situation occurs when expansion or upgrading of an existing system is proposed, apparently because the county feels it would increase the value of the system which it may want to purchase in the future.

So concerned was the Greater Miami Chamber of Commerce with the inaction of Metro Government on the problems of sanitary sewerage that it prepared a report in January 1970 entitled, "Study Report and Recommendations on Dade County Water and Sewer Problems."

In April 1970, the Department of Air and Water Pollution Control published "a Cursory View of Florida's Waste Treatment Plants and Future Needs." A map and listing showed 40 of the larger sewage treatment plants in Dade County and there are numerous additional smaller treatment plants not indicated. A look at this map shows the greater number are located well inland and most dump their effluent into canals.

This publication estimates the cost of collection to be $562,500,000 and the cost of providing secondary treatment $63,400,000. These totals exceed those for any other county in Florida by a wide margin. One reason is the great number of septic tanks that must be replaced by sewers, which, in turn, must be connected to an adequate treatment plant. If one grants a treatment efficiency of 15 percent to a septic tank, it is not difficult to see the large amounts of pollutants being placed in Dade County waters, both surface and subsurface.

Dade County rests on a limestone base known as oolite which is extremely porous. This allows ready movement of subsurface waters. Due to flat terrain and high water table much of the county could not have been developed without an extensive drainage system. Many of the canals were dug for this purpose. During periods of normal or heavy rainfall, waters drain from the land into the canals and flow toward the coast. During periods of low rainfall, waters drain laterally from the canals into the land.

Flow control structures are placed at varying locations to prevent salt water intrusion and control flow. During periods of deficient rainfall these are almost or completely closed. As a result of the lack of flow, waters retained by these structures stagnate and pollutants from inefficient treatment plants and septic tanks accumulate. In addition, there is some pollution burden caused by runoff from lawns, streets and other areas within the influence of drainage.

The Department believes from its investigation that the following are matters of particular importance and strongly recommends that Dade County be directed to:

1. Update the Metropolitan Dade County Master Plan for Sanitary Sewerage - There is need to update the 1961 plan to make it more compatible with present development pattern in Dade County and to fully take into consideration the wastewater treatment facilities that have been constructed during this 10-year period. And, further to incorporate the degree of treatment currently required by Florida's pollution control laws. As pointed out previously, septic tanks discharging to the porous subsoil in high density population areas are contributing septic tank effluents to the groundwater resource of Dade County, making it unpotable in some locations. Further, these effluents are seeping into the canal system and contributing to the pollution load of these waterways. The master plan should provide the capability to serve all new areas of residential and business development with sanitary sewers. It should also provide for sanitary sewer connections in all areas presently having

septic tanks and not served by such sewers. Exempted from this recommendation are single-family rural residences and isolated business locations.

Also, provision should be made for serving the marinas in Dade County with sanitary sewers. With appropriate State or county regulations it will be possible to handle sanitary toilet wastes from boats using the waters of the area; particularly those boats used as weekend or seasonal dwellings.

Furthermore, the master plan should provide for the early removal from the canal of all discharges of effluents from sanitary sewage and industrial waste treatment facilities. It is the belief of this Department that this will be more effective and more economical than for each treatment facility to provide for the ultimate in nutrient removal. In light of this, it is apparent that new discharges to the canals should be prohibited.

2. Provide Adequate Financing - The 1961 plan did not include a financial section to provide adequate guidance for overall planning. Financing the multi-million dollar needs of Dade County for sanitary sewerage is the key to improving the pollution situation.

To date there has been inadequate county and cooperative financing of master sewer facilities. Presently, county financing is principally through "borrowing" from ad valorem funds, with the county having the option of co-mingling net revenues with general funds. Revenue bond financing has been utilized only to a nominal degree.

There must be much more cooperation, fairly programmed and administered, between the county and the municipalities, industries and private developers. All possible avenues for financing sewerage facilities should be thoroughly investigated. Among some that have not been adequately considered are:

a. Leasing of facilities;

b. Lease-purchase agreements;

c. Agreements with private utilities to accept county bonds in payment of facilities;

d. Special taxing districts;

e. Issuance of bonds to developers for future systems.

More conventional means of financing must be employed to the maximum, such as: revenue bonds, general obligation bonds, and Federal and State construction grants.

3. Provide Effective Management - Currently, operation of those sewerage facilities owned by the county is vested in the Public Works Department, along with the highway, waste collection, building maintenance, motor pool, and water control.

Each is a major operation itself. Programming for water and sewerage is in an office of the county manager. Internal management is a county government function. Our purpose in mentioning it is that it needs attention.

The Chamber of Commerce, in its study previously mentioned, recommended creation of a Metropolitan Dade County Water and Sewer Authority as the best vehicle for achieving a unified, county-wide water and sewerage facility. Such authorities have been effective in other parts of the United States in successfully overcoming severe water and sewerage problems.

Following up on this recommendation, the Chamber was able to persuade the Commissioners of Dade County to create by ordinance the Metropolitan Dade County Water and Sewer Authority. Subsequently, the Authority Board was appointed. We recognize that this can be a productive, even though late, step forward. No director has been employed to date, to our knowledge.

4. Provide Enforcement of Pollution Control - Metropolitan Dade County has the most comprehensive and strongest pollution control ordinance in the State. Under it considerable progress has been made to abate pollution. The weakness has been failure to have strong enforcement of the

ordinance with the full support of the Metro and municipal governmental officials and departments.

The Department of Air and Water Pollution Control is fully aware that the quality of the water in the Dade County drainage system, the canals, is not acceptable for recreation uses. The Dade County drainage system was constructed to remove stormwater from the land, thus making Dade County habitable. It was not constructed to provide swimming and boating for the adjacent landowners. At times the water quality in the canals is very unsatisfactory, constituting a definite nuisance and health hazard. This condition is traceable to discharges of untreated or poorly treated wastewaters and to surface drainage from the land and roadways. Illegal discharges should have been prohibited and improperly operated treatment facilities ordered to provide proper treatment.

In some areas of the United States the State government has placed a ban on all connections to the sanitary sewerage system until the several local entities had agreed upon and presented comprehensive plans to provide the needed sewerage facilities. The plans included financial arrangements and a construction schedule. Similar action may be considered for Metropolitan Dade County. It would not only ban connections to sewers, it would prohibit the further installation of septic tanks in areas of high population densities.

Returning to the subject of master planning, this is the keystone upon which today's management of the environment rests. It was recognized as important by the Florida Legislature when it enacted Chapter 403, Florida Statutes, the State Water Pollution Control Act, wherein is the following statement, inference to the powers and duties of the Department:

403.061 "(1) Approve and promulgate current and long-range plans developed to provide for air and water quality control and pollution abatement."

Since reorganization the Department has been moving to undertake the preparation of comprehensive water quality management plans. As with so many programs, "incidents" have taken precedence over the planning objective. Funding is being requested to undertake a more effective program, and I might add a more rapid program.

While the Department has been endeavoring to get its planning function under way, the U. S. Department of the Interior moved toward requiring the States to provide basin-wide plans for pollution abatement. Under Title 18 - Conservation of Power and Water Resources of the United States Code, Chapter V, Part 601, which covers the water pollution control grants of the FWQA, the Department of the Interior has given notice that no grant shall be made for the construction of municipal wastewater treatment facilities unless there is an effective current basin-wide or metropolitan or regional plan for pollution abatement consistent with applicable water quality standards and approved by the State in the case of a metropolitan or regional plan.

The Department of the Interior specifies what shall be considered in determining whether a plan is appropriate. Subsequently the Federal Water Quality Administration has issued guidelines to the States for the development of basin and regional or metropolitan water pollution control plans. It permits the use of interim plans as a basis for approval of construction grants until July 1, 1973, provided such interim plans are identified and a schedule for completion of fully developed plans is developed by December 1, 1970.

Recommendations.

1. The Dade County Commission should forthwith authorize their Planning Department, either by their own employees, consultants or a combination thereof, to update the existing Master Sewerage Plan or to provide a new plan. This should include major input from the 27 municipalities. The final product should be presented to the State within 1 year in a form acceptable for certification under applicable

regulations, State and Federal. Such plan should include an acceptable timetable. The Master Plan should be flexible enough to consider advanced waste treatment and possible future water reuse.

2. The Dade County Commission should present a plan for financing the upgrading or conversion of present facilities and the installation of necessary sewerage collection systems.

3. The local pollution program should present a program for improving its surveillance of present sewage treatment plants, including spot testing of such facilities. Necessary equipment should be procured to facilitate this program.

4. Present laboratory equipment which appears to be inadequate to handle the necessary surveillance should be expanded to the necessary level.

5. The present staff should be upgraded and augmented to handle necessary water pollution control work.

6. The Dade County Commission should institute a moratorium on building for all overloaded or inadequate sewage treatment plants. Such a moratorium should be maintained by necessary means until compliance is obtained.

In conclusion, the Department calls the attention of the other counties of this tri-county area to the fact that the time is also at hand for them to take heed and act.

This concludes my statement, Mr. Reed and Mr. Chairman.

MR. STEIN: Thank you, Mr. Patton.

Any comments or questions?

I have several specific ones. These are designed to determine if the conferees decide where we are going to move.

Does the State of Florida have any authority to stop the construction of septic tanks in this area?

MR. REED: No.

MR. STEIN: How about--

MR. REED: That comes underneath the local pollution control act.

MR. STEIN: Well, as one of the conferees, you might raise yourself by your boot straps. If septic tanks are a real problem here and thus creating pollution of this area, I don't think we are laboring under these inhibitions.

MR. REED: Right.

MR. STEIN: How about package plants?

MR. REED: They would require a State permit to be constructed.

MR. STEIN: In other words, if we adopted the notion that package plants weren't desirable, the State could stop them?

MR. REED: Yes.

MR. STEIN: How about treatment plant specifications, does the State specify those?

MR. REED: Yes.

MR. STEIN: How about wastes from watercraft, can you regulate those from the State?

MR. REED: We were waiting for the Federal rules to be promulgated from the Secretary's office. That does not inhibit us from setting our own standards at any time in the State of Florida.

MR. STEIN: How about the removal of the effluents at the source, can the State require that or not?

MR. REED: Yes, underneath the permit rules they could.

MR. STEIN: Once this question of financing-- As I understand it, they have not used revenue bonds here or anything like it.

MR. REED: I think we will hear a presentation from the County Manager's office on this subject this afternoon.

MR. STEIN: All right. Who enforces the law here, the Water and Sewer Authority of the State or both?

MR. REED: No, the local pollution control program underneath the County Manager's office.

MR. STEIN: And they regulate the Water and Sewer Authority?

MR. REED: No, the Water and Sewer Authority--we are going to hear this, I hope, from the County Manager's office--is independent of that and simply is an agency which interested citizens who are appointed to that Board are going to see that the master plan is outlined and implemented.

MR. STEIN: Supposing there is an illegal discharge to the canals or waters here, who moves against those?

MR. REED: The local pollution control office.

MR. STEIN: The State doesn't?

MR. REED: No, the Dade County program underneath the requirements of the law has at the option of the County Commission become a local entity.

MR. STEIN: And the State doesn't do it?

MR. REED: The State has a well-written opinion from the Attorney General's office that says that if the law is not being enforced, then the State should enforce the law.

MR. STEIN: All right. As far as I can see, under the jurisdiction that we have exercised here with regard to destructive hurricanes, I see no inhibition of the Federal authority to move against illegal dischargers.

MR. REED: None. I don't think there should be any inhibition.

MR. STEIN: I don't think there is.

Now, how about a ban on construction and connection to sewers? Often that is our most effective weapon. Is the State issuing a ban as far as construction is concerned? You know, we have several financial aids in the Federal Government in a variety of the programs, but if we decide to use that, I think, as we have demonstrated in other places, a fairly effective ban can be put on construction.

MR. REED: Well, I am sure it is possible to put the ban on construction. I think we should--I think we will hear testimony to that in the next day and tomorrow as well as to the advisability of it. I think we should take special note of the hydraulically overloaded plants and make a decision on them.

MR. STEIN: Well, I would like to call your attention to the Potomac River where we have an acute pollution problem. And as a result of a conference like this, we placed a complete ban on construction in the Virginia and Maryland areas. According to the builders and a lot of the other people who have houses and people who have financing outstanding, this creates a tremendous hardship, but this was done.

Now, I wonder, are we going to be faced with a choice like that here?

MR. REED: I think we will have to see how the testimony this afternoon and tomorrow morning comes forth on that, Mr. Stein, to see what the conclusion should be.

MR. STEIN: All right.

As Mr. Patton referred to and as you know, we have these basin planning regulations. I would assume from listening this morning that the Dade County area is a drainage basin. Unless we had complete basin planning leading to adequate collection and treatment of the wastes, we couldn't make any Federal funds available.

Now, I have heard nothing so far that leads me to believe that you have a basin plan or that that basin plan is in effect. Mr. Patton indicated that we might have it in one year.

MR. REED: The 1961 master plan is dated, there is no question about that. And the question will be how rapidly the County Manager's office can bring this master plan up to date as a regional plan.

MR. STEIN: Well, Mr. Patton suggested a year. If that suggestion is followed, I take it that you expect to get absolutely no Federal funds at all. We would recommend this to all Federal agencies until that plan is brought into shape.

MR. REED: That would be a stringent requirement.

MR. STEIN: And I assume that this plan will include time schedules. Mr. Patton indicates advanced waste treatment requirements, water reuse, financing requirements, and I am most disturbed that he hasn't mentioned that you had to have surveillance and checking. If that is the case and you don't have the facilities for that, I can see how we are in the situation that has been alleged this morning--if you don't have the staff for checking and surveillance. How can we expect to have a program without additional equipment and expanding the staff?

MR. PATTON: Mr. Stein, I think I referred to that in Recommendations 3, 4 and 5, talking about the improvement of the surveillance program, including necessary spot testing, necessary equipment to be procured, upgrading the laboratory equipment, upgrading and augmentation of staff.

MR. STEIN: That is right. But without that--that is to be included in the plan.

Now, as I understand it, we are faced with a situation in which we have a plan that may be a year away.

MR. PATTON: No, sir, this was not intended to be a part of the plan. This is a separate item of the recommendation.

MR. STEIN: Right. When will that plan be forthcoming?

MR. PATTON: Well, I think that items 3, 4 and 5 should be undertaken just as rapidly as they can be accomplished. I think we are talking, as far as the updating of the plan, to do that as soon as possible and this is why I referred to a time of one year. But I don't think that the time of one year should elapse before items 3, 4 and 5 should be carried out.

MR. STEIN: We are agreed on that. But we may be faced with the choice of a moratorium on all building here until we get moving, and this is the question. Is the suggestion that the situation is so bad that we come up with a complete moratorium on building and that includes apartments, shopping centers, hotels, condominiums and all the other things you people seem to desire down here--we wait a year until the plan is in? Or is there a possibility that we don't have to do this?

We have done this in other areas. Or this is what is required, we would like to have your recommendation.

MR. REED: I think we prefer to wait until the full testimony of the conference is in on that.

MR. STEIN: Right.

Are there any other comments or questions?

If not, thank you very much.

MR. REED: Mr. Stein, I would like to introduce as our next witness Mr. Herbert Hoover, Jr., President of the Hoover Environmental Legal Defense Fund, who lives in Bal Harbour and who has done outstanding work as a citizen to identify the pollution problems in Dade County. He has a presentation for the conferees.

MR. STEIN: All right.

MR. REED: Mr. Hoover is at the end of the table, Mr. Stein.

HERBERT W. HOOVER, JR., PRESIDENT
HOOVER ENVIRONMENTAL LEGAL DEFENSE FUND
BAL HARBOUR, FLORIDA

MR. HOOVER: First, gentlemen, you don't know how glad we are in south Florida to see you here. We only regret that things have come to this, that we have not been able to solve our own problems and protect our own environment. As one who was instrumental in requesting that this conference be called, I welcome you.

Two of the most widespread topics of conservation today are crime and pollution. But they are not two separate elements. Pollution of our waters is a crime. And it is about time that we in Florida start treating it as such.

We have the laws, gentlemen. Now we need teeth for the dragon--enforcement. And 1971 is the year to do it.

Until the last session of the Florida Legislature, the State had been empowered to fine pollution offenders $1,000 a day for each day of a continuing water pollution offense. It is now $5,000 a day. This law also calls for imprisonment of up to one year for each day of offense.

Yet all the people have been getting, then and now, are excuses. And all our enforcement agencies and courts have been giving in southern Florida are variances, which help perpetuate the water pollution crisis.

Certainly there are excuses for endemic pollution, just as there are excuses for endemic crime. Officers of huge corporations have been sent to prison for price fixing. Which is a more serious offense, price fixing or pollution?

Society is hard on the armed robber because he endangers the lives of others by his acts. I contend that pollution violators are equally menacing, only they are pointing a bigger gun at the people.

How much has the State collected in fines from chronic pollution violators? Let's face it, not very much. And the fines which have been issued are usually token. Industries can laugh them off. Up to now it has been cheaper to be fined than to get down to the issue of spending money to correct the sources of pollution.

The industrial polluter, however, is not the most dangerous in Florida. There is one polluter who is even worse: the municipality. It is the municipality in Florida which is causing the most damage and pouring the most filth into our lakes, waterways, bays and ocean.

I propose, gentlemen, that we become just as tough with the municipality as with the industrial polluter. If fines are not incentive enough, then let us consider the possibility of putting the responsible officials into jail. Will the public be shocked? No more than they should be by the state of our water. And certainly no more shocking than conduct of governmental agencies who have let their public trust become putrid with neglect.

I ask also at this conference that we give consideration to one more piece of legislation. As it stands now, any fines or civil damage suits against polluters are put into our State general fund after being collected. Granted, this has not heretofore amounted to much. But under vigorous enforcement, the monies collected could help solve some of the problems of pollution.

I hope the Florida Legislature, therefore, will give consideration to passing a law that will earmark fines collected for the building of proper treatment plants. Mr. Vince Patton, the Director of our State Department of Air and Water Pollution Control, warns that otherwise we are really adding to the problems of the overbonded municipality.

The time for a showdown has come in south Florida. There are ways for the municipality to show that it is sincerely interested in attempting to solve these problems.

Hopefully, our Florida voters will in November approve the constitutional amendment which will allow the floating of State bonds to finance the construction of air and water pollution control and solid waste disposal facilities.

This simply means that the State would put its full faith and credit into bond issues of municipalities which would solve the water pollution crisis.

It would be a measure to save money for the taxpayer. Dade must expend some $800 million to provide the proper facilities for adequate sewage treatment. This constitutional amendment could save Dade County $100 million in reduced interest and Federal fund increases. The sad fact, of course, is that the cost is now up to the $800 million level. It would have been much less only a few years ago. And the cost will continue to increase as time passes.

It's not a matter of if Dade County has this bond issue, but when.

And our three southeast Florida counties, Palm Beach, Broward and Dade, must finally come up with a master plan for sewage treatment, something they have dawdled with for years and never done.

The Federal Water Quality Administration has just shown us that we are poisoning our drinking water with sewage, as well as our ocean, canals, rivers and lakes.

Of our 40 major sewage plants, they say 30 are discharging effluent into the canals and 4 discharge through 3 ocean outfalls.

The first phase of the Hoover Environmental Legal Defense Fund was to conduct the necessary studies to evaluate the problem in Dade County as well as to be an impetus for conferences such as this.

We are now ready to move into the second phase--the gathering of evidence for successful prosecutions. If no one else will bring these irresponsible and chronic water pollution offenders to court, then we shall. And we shall ask for the full measure of prosecution. The offenders will be fined until they correct the problems or else they will go to jail.

I repeat, ladies and gentlemen: Pollution is not an infraction; it is a crime. And we must begin treating it as such.

Thank you, Mr. Stein. (Applause.)

MR. STEIN: Thank you.

Are there any comments or questions?

MR. REED: There are several good points that Mr. Hoover made, Mr. Stein. One was the case on where the fines go. The fines do go into the general fund. I have made every effort in the last session of the legislature to see that that was reversed but was unable to, but I am hoping that at the next session that will be changed.

There has been better collection, perhaps, than most people know. I can think of $200,000, several $40,000, and $50,000 settlements--not settlements--legal fines, and we have one in the Supreme Court now in excess of $100,000.

We have not been aggressive in the local approved programs. There is no use saying we have, because we haven't. We haven't had the manpower to come into the local programs and our hope has been that the local programs would exercise jurisdiction.

Now, they have had some distinct problems in this area with their own court system which might have been avoided if the State had come in and made some of these cases. This is conjecture. But they have had problems here in the local municipal courts and county courts where the justices do not feel that water pollution is a crime, as Mr. Hoover has outlined.

MR. STEIN: Mr. Hoover did say something. He said, "The time for a showdown has come..." I would like to indicate to you, Mr. Reed, in the Government calling this conference at the request of Governor Kirk, the showdown is here. As I indicated before, unless the situation is reversed by subsequent testimony, as far as I am concerned this is going to be a major priority area for the Federal Government to clean up if the Federal report and the State report are substantially correct. And I think the day is over when you lack personnel or lack teams or lack equpiment to gather the evidence. Because I think we have demonstrated over and over again in various parts of the country that we can get the evidence; we can make this evidence stick; and I don't see many higher priority areas in the country than the Dade County area; and you are going to get our full attention. (Applause.)

As far as I am concerned, when we go to court we go to a Federal court.

Are there any other comments?

Mr. Reed, would you continue.

MR. REED: All right.

The next witness the State would like to invite to speak is Mr. William Storch, Chief Engineer, Central and Southern Florida Flood Control District, from the West Palm Beach office.

Many of the canals that have been shown to be polluted belong to the agency, the Central & Southern Flood Control District. Bill Storch, who is the Chief Engineer, is perhaps one of the best known and most talented engineers in the entire State of Florida if not in the Southeast, and he is a particularly ardent spokesman for clean water.

WILLIAM V. STORCH, CHIEF ENGINEER
CENTRAL & SOUTHERN FLORIDA FLOOD
CONTROL DISTRICT, WEST PALM BEACH, FLORIDA

MR. STORCH: Thank you, Mr. Reed. I think I have been adequately identified for the secretary.

I am sorry, conferees, that I do not have a prepared statement. The statement that I do have is rather hastily prepared, but I will have it typed and submitted to you if the record is open.

MR. STEIN: We will keep the record open for a week after the conference.

MR. STORCH: Fine. Thank you, sir.

Two conclusions of the FWQA report which are of major concern to the Central & Southern Florida Flood Control District are:

1) That the inland waters of Dade County are either polluted, in the case of northern Dade County, or are showing signs of pollution, as evidenced by fish kills in southern Dade County.

2) That the major cause of poor quality water is inadequately treated municipal sewage effluent.

Most of the major inland waterways of Dade County are under the jurisdiction of the flood control district for purposes of, first, alleviation of the flood hazard; next, regulation of stream flow; third, prevention of salt water intrusion; and fourth, maintenance of groundwater at levels suitable for several types of land usage.

Jurisdiction for these purposes is principally exercised by the flood control district through (a) physical means, the operation of our regulatory structures; and (b) institutional means, the exercise of the district's statutory authority via permit procedures.

The conclusions of Mr. Hagan's report which I have noted above have been recognized by the district's governing board and accordingly the district board intends to exercise its permit authority in the interest of preventing further degradation in the quality of inland waters under its jurisdiction, not only in Dade County but elsewhere throughout the district.

In simplest terms, district right-of-way must be crossed in order for wastewater discharge facilities connecting with our system to be installed. Such facilities must receive a district permit.

Based on a staff report, the district's governing board at its October 16, 1970, meeting instructed the staff to prepare a listing of district waterways on which district permits for wastewater discharge will no longer be issued. This list of prescribed waterways will, on the board's instructions, be furnished to the Department of Air and Water Pollution Control, the Division of Health and Rehabilitative Services, and the local pollution control agencies. Staff work on the preparation of this list of prescribed waterways is now under way and should be completed within the next two to three weeks.

We would hope that this action will add to the impetus for, first, upgrading treatment at existing treatment facilities; and secondly, undertaking a comprehensive evaluation of the assimilative capability of these waterways which will relate degree of treatment and total loading to minimum available stream flows.

In conclusion, we have noted two items in Mr. Hagan's conclusions and recommendations which are specifically of concern to the flood control district and which I feel I should make some comment on.

First the report suggests that further study is needed to determine the interrelationship between the canal system and the Biscayne aquifer. We agree with this. A great deal of information has already been collected in the past 15 years concerning the Biscayne acquifer, much of it financially supported by Dade County and the flood control district in cooperation with the United States Geological Survey.

In recent years additional emphasis has been placed on the investigation of canal groundwater relationships from the hydrologic standpoint. An analogue model of the Biscayne acquifer has been developed by the Geological Survey in cooperation with the district and Everglades National Park. It is expected that considerable insight as to canal groundwater relationships will be gained through the use of this tool.

So, gentlemen, I am pointing out that there is a considerable amount of knowledge concerning the Biscayne acquifer available and we are continuing with our investigations.

Secondly, the report recommends that the operations of the flood control district be reviewed in order to determine its effect upon the water quality of the inland canal system and the estuarine waters. From a purely operational standpoint, that is the regulation of water levels and stream flow to achieve the objectives which I noted earlier, there appears to be a limited number of options available to use operational means to improve water quality. However, we will welcome any suggestions in this regard which will open up new avenues of approach.

We appreciate this opportunity to offer a statement at this hearing and I am available for any questions, gentlemen.

MR. STEIN: Thank you, Mr. Storch.

Any questions or comments?

Mr. Thoman.

MR. THOMAN: I have some comments, Mr. Storch, and I want to second Mr. Reed's fine comments about you and your relationship to the flood control district and your interest in water quality and, of course, your very great knowledge and expertise, and so forth, in the operations of the flood control district.

I note with extreme pleasure that the district has voted to exercise its permit authority. And I am certainly glad to hear that you are cooperating with the USGS in an analogue

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STATE OF FLORIDA
DEPARTMENT OF
AIR & WATER POLLUTION CONTROL
SUITE 300, TALLAHASSEE BANK BUILDING
315 SOUTH CALHOUN STREET, TALLAHASSEE, FLORIDA 32301
TELEPHONE (904) 224-9151

VINCENT D. PATTON
EXECUTIVE DIRECTOR

NATHANIEL P. REED
CHAIRMAN

October 27, 1970

Dade County Federal-State
Enforcement Conference
October 20-22, 1970

Mr. Murray Stein
Assistant Commissioner
Office of Enforcement
U. S. Department of Interior
Federal Water Quality Administration
Washington, D. C. 20242

Dear Murray:

We are transmitting to you as Chairman of the Dade County Enforcement Conference, for inclusion in the record, a statement presented by Mr. W. V. Storch of the Central & Southern Flood Control District.

Your cooperation in this matter will be appreciated.

Sincerely yours,

Vincent D Patton

Vincent D. Patton

VDP:vs

CHARLES M. DAVIS
BOARD MEMBER

JOHN P. ROBERTS
BOARD MEMBER

JAY E. SCHENCK
BOARD MEMBER

A. D. VINCENT
BOARD MEMBER

STATEMENT OF W. V. STORCH, CHIEF ENGINEER
Central and Southern Florida Flood Control District
presented at
Dade Pollution Enforcement Conference
Miami, Florida October 20, 1970

The two conclusions of the FWQA report which are of major concern to the Central and Southern Florida Flood Control District are:

(a) that the inland waters of Dade County are either polluted (in the case of northern Dade), or are showing signs of pollution (in the case of south Dade); and

(b) that the major cause of poor quality water is inadequately treated municipal sewage effluent.

Most of the major inland waterways of Dade County are under the jurisdiction of the Flood Control District for purposes of:

(a) alleviation of the flood hazard

(b) regulation of streamflow

(c) prevention of salt water intrusion

(d) maintenance of ground water at levels suitable for several types of land usage.

Jurisdiction for these purposes is principally exercised by the District through:

(a) physical means - the operation of regulatory structures, and

(b) institutional means - the exercise of statutory authority via permit procedures.

The conclusions of the FWQA report noted above have been recognized by the District's staff and Governing Board. Accordingly the District Board intends to exercise its permit authority in the interest of preventing further degradation in the quality of inland waters under its jurisdiction, not only in Dade County but elsewhere.

In simplest terms District right-of-way must be crossed in order for wastewater discharge facilities connecting with our system to be installed. Such facilities must receive a District permit. The District's Governing Board at its October 16, 1970 meeting instructed the staff to prepare a listing of District waterways on which District permits for wastewater discharge facilities will no longer be issued. This list of proscribed waterways will, in accordance with the Board's instructions, be furnished the DAWPC, Department of Health and Rehabilitative Services, and local pollution control agencies. Staff work on the preparation of this list is now underway.

We would hope that this action will add to the impetus for:

(a) upgrading treatment at existing treatment facilities, and

(b) undertaking a comprehensive evaluation of the assimilative capabilities of these waterways which will relate degree of treatment and total loading to minimum available streamflow.

In conclusion, we have noted two items in the conclusions and recommendations of the FWQA report which are of specific interest to the Flood Control District.

First, the report suggests that further study is needed to determine the interrelationship between the canal system and the Biscayne Aquifer. A great deal of information has been collected in the past fifteen years concerning the Biscayne Aquifer, much of it financially supported by Dade County and the Flood Control District in cooperation with the USGS. In recent years additional emphasis has been placed on the investigation of canal-ground water relationships from the hydrologic standpoint. An analog model of the Biscayne Aquifer has been developed by the USGS in cooperation with the District and Everglades National Park. It is expected that considerable insight as to canal-ground water relationships will be gained through the use of this tool.

Secondly, the report recommends that the operations of the District be reviewed in order to determine its effect upon the water quality of the inland canal system and the estuarine waters. From a purely operational standpoint - that is, the regulation of water levels and streamflow for the purposes noted earlier - there appears to be a limited number of options available to use operational means to improve water quality. However, we will welcome any suggestions in this regard which will open up new avenues of approach.

The District appreciates this opportunity to offer a statement at this hearing.

model of this aquifer. I think that will contribute immeasurably to our knowledge of the groundwater relationships down here.

I believe that the recommendation in Mr. Hagan's report for a review of the operations of the Central & Southern Flood Control District was mainly directed at seeing if there weren't some other things that might be done with your operations that would help to improve water quality. Now, we don't know what they are. You and I were raised in the age of ecological suicide, literally. We controlled malaria by cutting the breeding cycle of the anopheles mosquito. We built dikes around Lake Okeechobee and you built this great Central & Southern Florida Flood Control District and you haven't had floods here for umpteen years. It is a great engineering achievement. With our knowledge of today, which albeit limited, of the impact of any man-made structure on the ecology, we might have done things a little bit differently.

And I think that all that Mr. Hagan was suggesting in his recommendation, and it is possible that the conferees might suggest this, is that we take another deeper fresher look at the operations of your great organization and the valuable protection that it has afforded to the people of south Florida to see whether there isn't something that we might be able to change just a little bit to help improve water quality. We don't know what it is, but with your vast knowledge of the area maybe you will be able to help more than we can.

MR. STORCH: Well, I would just like to comment on that if I may, Mr. Thoman.

I said that it appears to me that there are a limited number of options available if we operate for the purposes that I had enumerated earlier. I didn't say there were no options. I said there may be a limited number of options and that we would welcome any suggestions made by your organization or the Department of Air and Water Pollution Control to change and modify our operational procedures in the interests of water quality control. There may be several things that we can do, but I am pointing out that they may be limited.

Now, insofar as new construction or future construction is concerned, I certainly agree with you. If we were doing things now, we may do them and quite probably would do them quite a bit differently than we did them 15 or 20 years ago and we are certainly aware of this. This is not an operational problem; this is a design and planning problem. And we are certainly aware of these other considerations, these other values, which perhaps we had a tendency to ignore or underplay in the past.

MR. THOMAN: Let's don't wear the hair shirt too long. I helped eliminate anopheles mosquitos in Mississippi and I was real proud of the fact--

MR. STEIN: Just females?

MR. THOMAN: Well, no, we killed a couple of males too. --to get rid of malaria, and we did what was necessary at the time. I know with your great talent and expertise here in this area that you will devote every effort that you can to helping with it.

MR. STORCH: Yes. I think the action of our board, the action which was taken last Friday, is certainly, at least in our opinion and in the board's opinion, an appropriate step and a proper step that is within our authority to take.

MR. REED: A very significant step, I would say.

MR. STEIN: Yes.

Let me point out, these waterways you are going to name in the next few weeks, I assume you are going to take the list that Mr. Hagan gave and look that over very carefully.

MR. STORCH: We have already started examining Mr. Hagan's list. There will be several in Dade County. I think we are interested not only in the type of information that Mr. Hagan's report has produced. but also the information that is available to us, and appropriately to us, in terms of available stream flow. This is a very important parameter in this equation, and in many of these canals, as has been indicated here amply this morning, there are times when there is zero stream flow.

MR. STEIN: Right.

MR. STORCH: And this is one of the critical things that we are going to be looking at as we make this determination and as we establish this prescribed list.

And I might point out, as I said before, this will not only be in Dade County but it will be elsewhere throughout the district, and Palm Beach and Broward Counties will undoubtedly have some representatives on that list.

MR. STEIN: You did mention one point, and that is to take into account the assimilative capacity of the water in these canals. Again I had never made or checked a real survey of this, but I have driven around and looked at these canals here. As far as I can see, the stream flow is relatively sluggish. I see people fishing there all the time. They are handling their lines and getting their hands on that line and the hook and the material and they do what people normally do with their hands after they finish it; they put them up to their nose or their mouth. What kind of assimilative capacity, really, do you think these backwater canals have?

MR. STORCH: The opportunities for reoxygenation are rather limited.

MR. STEIN: Thank you.

Are there any other comments or questions?

If not, thank you very much.

MR. THOMAN: Thank you very much, Mr. Storch.

MR. REED: The next to the last major State witness is Robert Vernon. Bob Vernon is the Chief of the Section of Geology, Department of Natural Resources, Tallahassee, and one of the outstanding experts on the geology of all parts of Florida, but especially of south Florida, who has had a long history of being terribly interested in the conservation and reuse of sewage waters.

ROBERT O. VERNON, CHIEF
BUREAU OF GEOLOGY, DEPARTMENT OF
NATURAL RESOURCES, STATE OF FLORIDA
TALLAHASSEE, FLORIDA

MR. VERNON: I am Robert Vernon, Chief of the Bureau of Geology of the Department of Natural Resources. Our responsibilities include those of developing data on our water and mineral resources. I would just like to lay a little background for the report which I have handed [illegible] you and I ask that you place it in evidence.

Florida is part of a larger platform, the rim of the great sedimentary basin that occurs at the mouth of the Mississippi River--

MR. STEIN: Do you want this in the record, sir?

MR. VERNON: If you would, please.

MR. STEIN: All right. Now, may I go off the record for just one second, and this is just general.

(Off the record.)

MR. STEIN: Let's go back on the record.

Without objection, this material will be put in the record as if read.

(Which report follows:)

STATE OF FLORIDA
DEPARTMENT OF NATURAL RESOURCES

BUREAU OF GEOLOGY
Robert O. Vernon, *Chief*

INFORMATION CIRCULAR NO. 70

THE BENEFICIAL USE OF ZONES OF HIGH TRANSMISSIVITIES IN THE FLORIDA SUBSURFACE FOR WATER STORAGE AND WASTE DISPOSAL

By
Robert O. Vernon

TALLAHASSEE
1970

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THE BENEFICIAL USE OF ZONES OF HIGH TRANSMISSIVITIES IN THE FLORIDA SUBSURFACE FOR WATER STORAGE AND WASTE DISPOSAL [1]

By
Robert O. Vernon

INTRODUCTION

Urban sprawl, and all its attendant problems, is here. In Florida, this has been intensified by a special problem - the coastal zone - a land of high-intensity urbanization localized where the sea and our citizens interact. Florida is blessed by a long coastline of beautiful beaches, indented by estuaries, lagoons and spring-fed rivers. Rocky and sandy islands invite habitation. A large and varied fauna and flora make recreation an avocation and work a pleasure.

Accompanying these people are all the sustaining, and satellite industries that find the climate, labor, and commodity markets, cheap water transportation, and natural resources to be attractive. Projections of population growth indicate that by the year 2000 a megalopolis will stretch down the Atlantic Seaboard from Georgia to encompass the Keys and extend northward along the Gulf to Alabama. This city will be fenced by the sea on one side and by the water management works, necessary to provide the water supply for this complex, on the other. What can we do about increasing the amount of water available for this population and disposing of the resultant wastes???

Rarely has there been tendered a more favorable opportunity for a project of coordinated planning and development that will provide public access to beaches and multiple use of the coastal lands. Florida, as a peninsula swept by ocean breezes, having a largely indigenous water supply and only the beginning of the pollution of its estuarine and coastal waters can cope with air, water and coastal dissipation and pollution, if we have a beginning at meeting these resource needs, including the provision of a constant water supply and the limiting of pollution. The answer to both problems of water supply and waste disposal would appear to lie underground, where the porous limestones, interbedded with impervious fine-grained sediments, are saturated with ground-waters that circulate through these aquifers to empty to the ocean and gulf along the continental slopes, as shown in figure 1.

The injection of liquid wastes into the subsurface has proved to be both safe and economical and is gaining wide acceptance. (See the Interstate Oil Compact - Research Committee Report "Subsurface Disposal of Industrial Wastes," 1968) The most important requirement for a successful completion and operation of injection facilities is to have the benefit of "clergy" - the well must be built from a cooperative programming by professional engineers, geologists, and economists, under rigid specifications. The construction must be by a competent well driller, under professional supervision. A strong recommendation is also made that the services of recognized logging and cementing companies be utilized.

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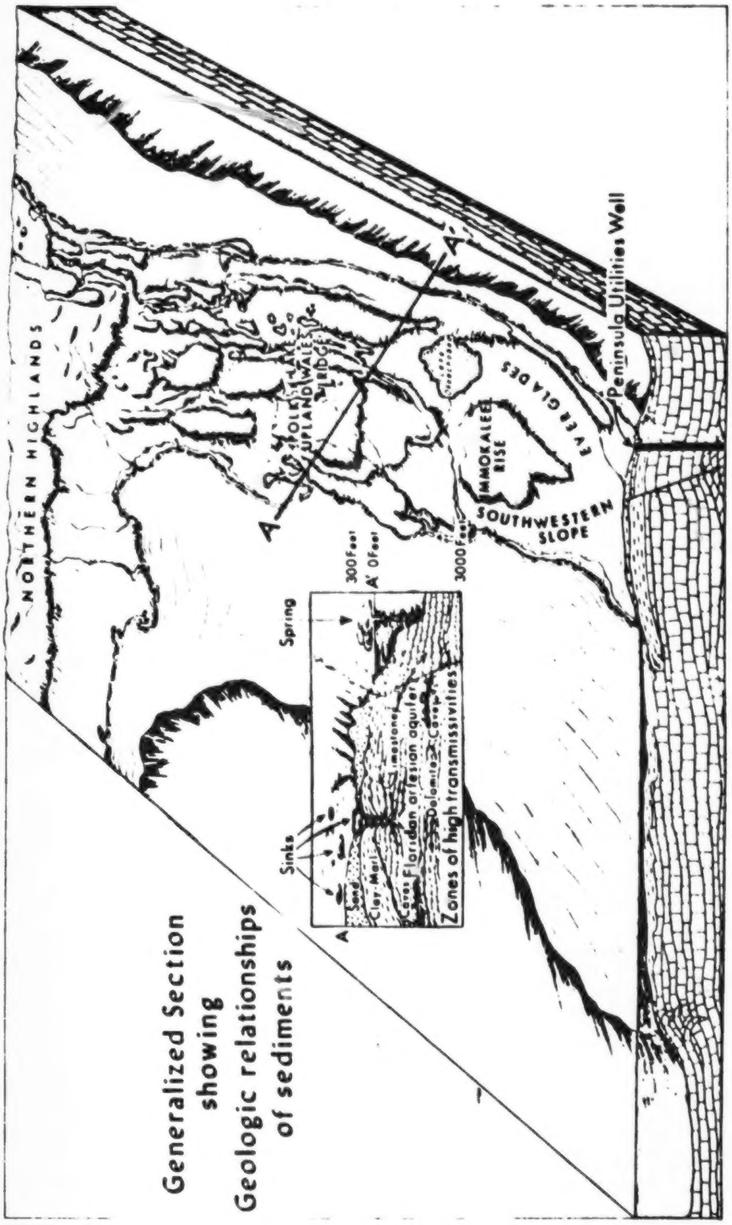
[1] These data in much of this paper have been released as open file reports prepared by Robert Vernon and by Dr. J.I. Garcia - Bengochea of Black - Crow and Eidsness, Gainesville, Florida. This is the first formal publication.



Generalized Section
showing
Geologic relationships
of sediments
NORTHERN HIGHLANDS
POLK UPLAND
LAKE WALES RIDGE
A
A'
IMMOKALEE RISE
EVERGLADES
SOUTHWESTERN SLOPE
Peninsula Utilities Well
Sinks
Spring
300 Feet
A' 0 Feet
3000 Feet
A
Sand
Clay, Marl
Limestone
Floridan artesian aquifer
Dolomite
Caves
Zones of high transmissivities

Figure 1. Bathrymetry of Florida.

Disposal wells have been used in the oil industry for years: In Florida two brine disposal wells have been operated for 26 years with no salt-water pollution or inversion of hydrologic quality having resulted. In the past five years two waste injection wells have been used without incident, one disposing of 1% acetic acid, the other an acid chemical waste.

It is estimated that more than 6500 lake-control and drainage wells are currently functioning in the karst area of Florida. Vernon and Garcia (1968) indicated:

"For a well-injection system to function properly and safely:

1.) The subsurface reservoir must be permeable and able to receive liquids under safe injection pressures for unlimited periods of time. The beds of the Floridan aquifer are exposed to the sea along the continental slope, and these reservoirs serve as landfalls to the ocean.

2.) Sediments must separate usable water in the reservoirs from any unusable water - ground water in Florida is extremely salty below the Floridan aquifer and no restrictive bed is required at the base of the aquifer but some are present.

3.) The liquids injected must not clog the pores of the rock by sedimentation or react adversely with the rock and its water. Buffer zones can be used.

4.) Monitoring must be an integral part of any waste-injection system."

Many factors influence the feasibility of constructing and operating an injection well and whether for water storage or waste disposal, the regulatory agencies rank high, as would the cost of construction of a well versus the more conventional methods of storage and of disposal, erosion of equipment, cost of pre-treatment required, and the operational costs. In analyses of these generally, well injection is much cheaper than the usual methods of treatment and disposal, and expensive land is not covered by water-storage. A well, typical of those constructed to use zones of high transmissivity and protect the usable water resources, is shown in figure 2. Many of these wells can be constructed for less than the cost of one mile of sewerage line.

HYDROGEOLOGY OF FLORIDA

The source of much of Florida's water supply for municipal, industrial, agricultural, and private uses is the Floridan aquifer, a hydrologic system sometimes referred to as "the principal artesian aquifer," The term applies to all those permeable sediments, largely limestone and dolostone, of whatever age, that respond as a hydrologic unit, or as a series of interconnected units to the predominant artesian pressure of the State. These sediments are present throughout all of Florida and parts of Alabama, Georgia and South Carolina. The aquifer is exposed to ocean waters along the slopes of the Atlantic and Gulf, and the artesian water occurs as a bubble that depresses the salt water which is present uniformly in the Florida subsurface.

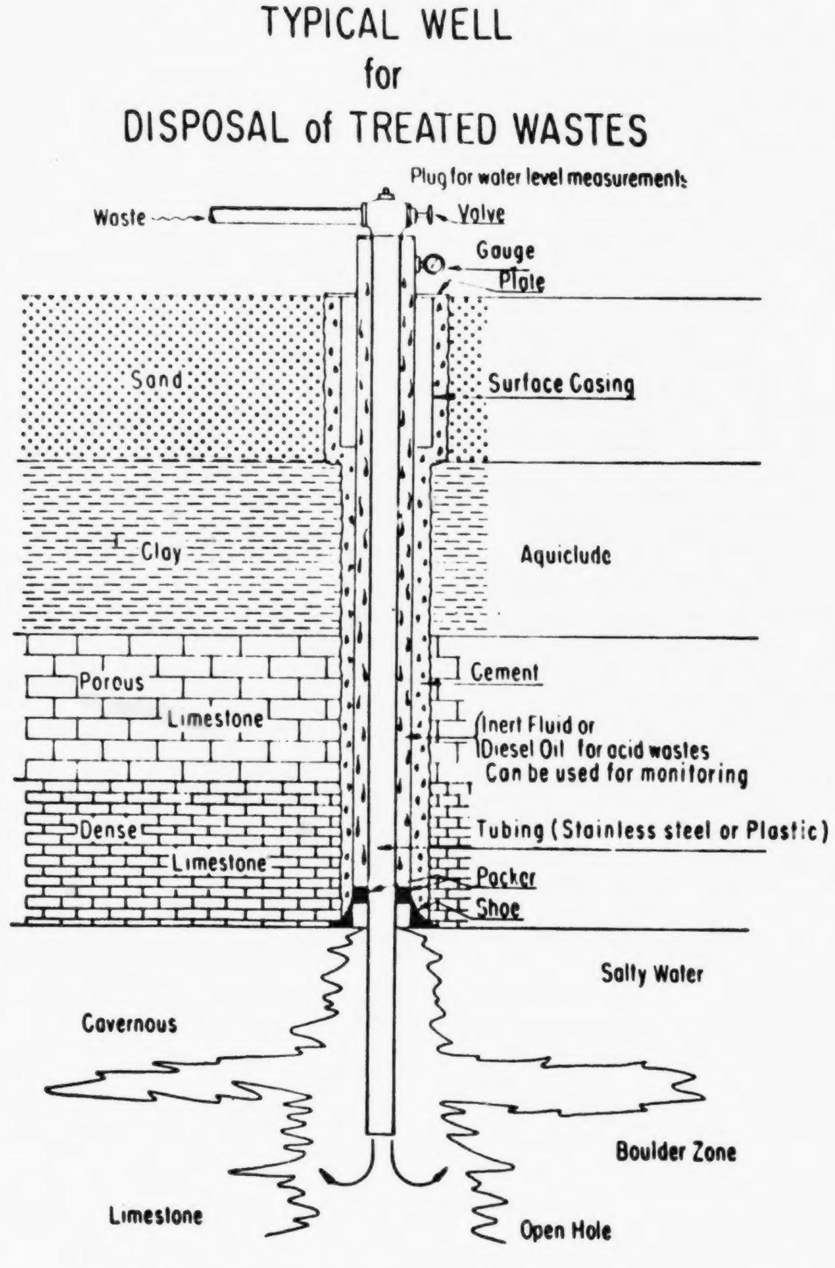

TYPICAL WELL
for
DISPOSAL of TREATED WASTES
Plug for water level measurements
Waste
Valve
Gauge
Plate
Sand
Surface Casing
Clay
Aquiclude
Porous
Limestone
Cement
Inert Fluid or
Diesel Oil for acid wastes
Can be used for monitoring
Dense
Limestone
Tubing (Stainless steel or Plastic)
Packer
Shoe
Salty Water
Cavernous
Boulder Zone
Limestone
Open Hole

Figure 2. Typical injection well construction.

Overlying the Floridan aquifer, except where it is exposed, and confining its water under pressure, is the Floridan aquiclude, a section of variable clastic sediments consisting of shell marls, sands, gravel, and clay-sized carbonates, all of which have in common a relatively low vertical permeability. The aquiclude not only caps the artesian aquifer but it also forms the base of shallow ground water (including the Biscayne aquifer, the principal source of water in the southeastern Florida Peninsula) and isolates the artesian aquifer so that it gains no water in the area and loses water only by upward seepage.

The Floridan aquiclude is widely distributed over Florida, but it is thin to absent in the western peninsula and northeastern panhandle. Near West Palm Beach it is more than 900 feet thick and at Pensacola it exceeds 1000 feet. Figure 3 shows the approximate top of the Floridan aquifer throughout Florida. The interval from the ground surface to the top of the aquifer consists of the Floridan aquiclude, secondary artesian aquifers, and shallow water-table aquifers. In effect, it is essentially the interval that must be cased to eliminate caving formations and the mixing of waters up the hole above the Floridan aquifer.

TOP OF ARTESIAN AQUIFER

In an attempt to map the top of the artesian aquifer more exactly, an effort was made to identify the aquifer in a number of wells over Florida and the top of the artesian aquifer has been defined more exactly than previously (fig. 3). In the areas of flow, the top of the aquifer is placed at the depth to which the well has penetrated when the first flow of water appeared at the ground surface, generally adjusted to conform to the top of the section of carbonate that formed the aquifer. In areas of non-flow, the top of the aquifer was placed at the penetration of the lowest head of water, when more than one head was encountered. This was also generally coextensive with the top of the carbonate section.

As mapped, the top of the aquifer varies considerably in elevation, ranging from sea level along the western part of the peninsula and northern panhandle to about 1000 feet sub-sea along the panhandle and distal peninsular Gulf sides of Florida. Some of the local relief is controlled by geologic structures. A deep depression along the central peninsular part of the area is associated with a fault block mapped by Vernon (1955) and Lichtler (1960). It has depressed the top of the aquifer as much as 100 feet along the Atlantic Ocean, parallel to the coastline in southeast Florida, as shown in figures 3 and 4.

A deep basin that traverses the State at the latitude of Lake Okeechobee and more or less bounds a ridge of low transmissivities that contains fairly potable water to the south, may help to explain the incongruities of the performance of

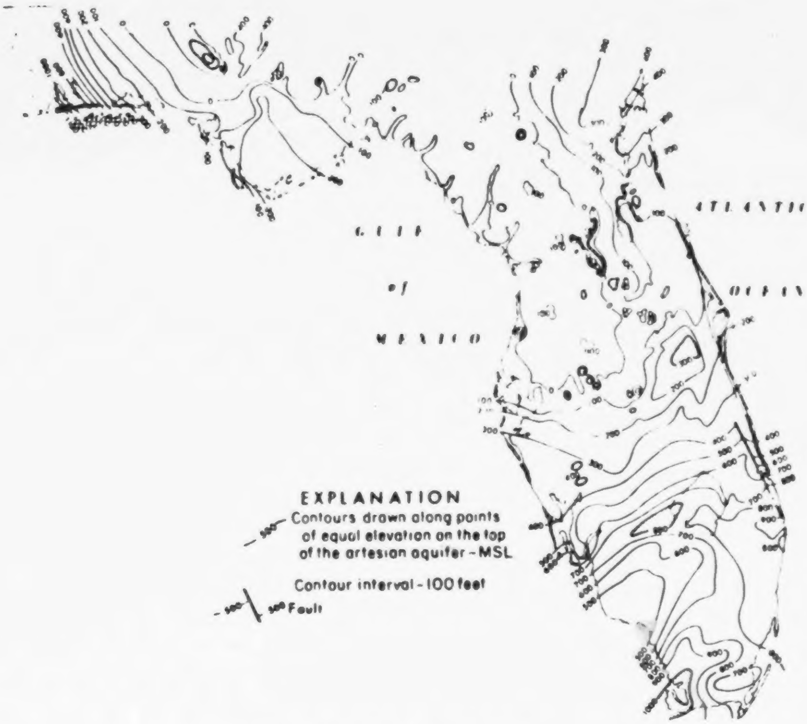

GULF
OF
MEXICO
ATLANTIC
OCEAN
EXPLANATION
Contours drawn along points of equal elevation on the top of the artesian aquifer - MSL
Contour interval - 100 feet
Fault

Figure 3. Top of Artesian Aquifer.

the aquifer in these areas, i.e., highly mineralized water below the lake and fairly fresh water channeled into the buried limestone ridge at Everglades City. A ridge along the top of the aquifer, bounded by the 800 foot contour, extends down the east-center of the peninsula and corresponds in the most part to a ridge in the equipotential surface, figure 5. Wells drilled (at Pennekamp State Park, Royal Palm Park, and Grossman's Hammock) along this ridge produce large yields of water of low chlorides (less than 3000 ppm). The Pennekamp well, located on Key Largo, after free flow from 1965-1970, has freshened, from 2600 to about 2100 mg/l. This would indicate the freshening from salty water used in drilling and also reflects the spread of the cone toward recharge and the capture of fresher water.

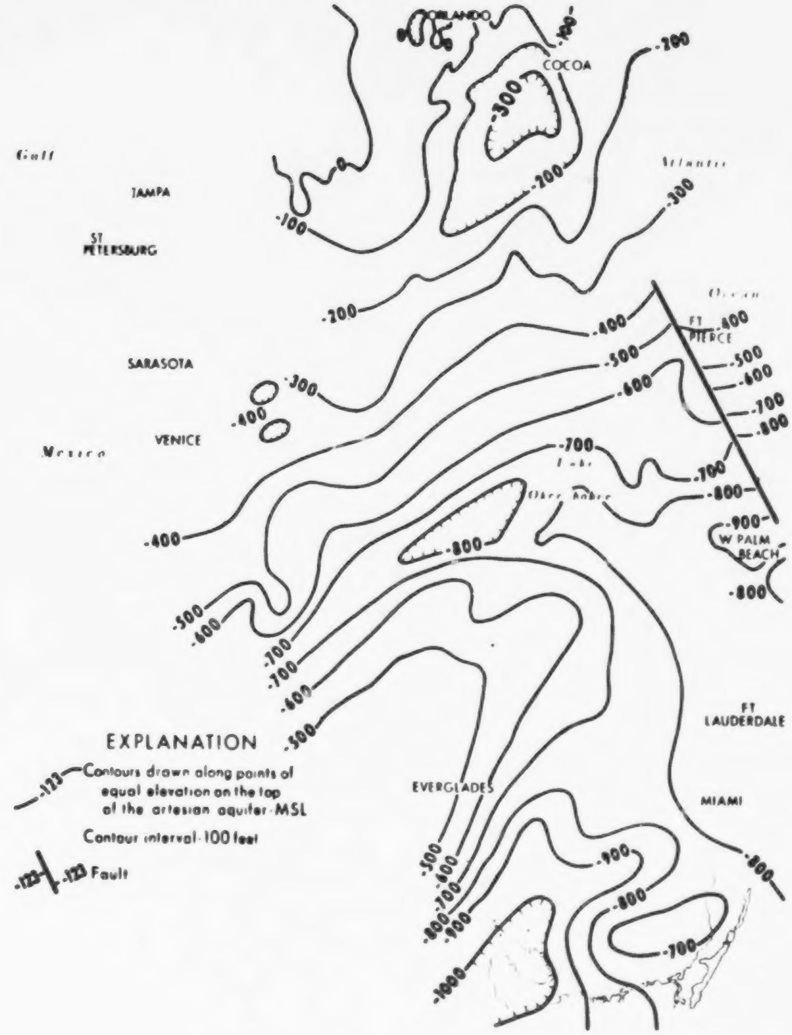

ORLANDO
COCOA
Gulf
TAMPA
ST PETERSBURG
Atlantic
Ocean
SARASOTA
VENICE
Mexico
Lake Okeechobee
FT PIERCE
W PALM BEACH
FT LAUDERDALE
MIAMI
EVERGLADES
-100
0
-200
-300
-400
-500
-600
-700
-800
-900
-1000
EXPLANATION
-123 Contours drawn along points of equal elevation on the top of the artesian aquifer-MSL
Contour interval-100 feet
-123 -123 Fault

Figure 4. Top of distal end of artesian aquifer.

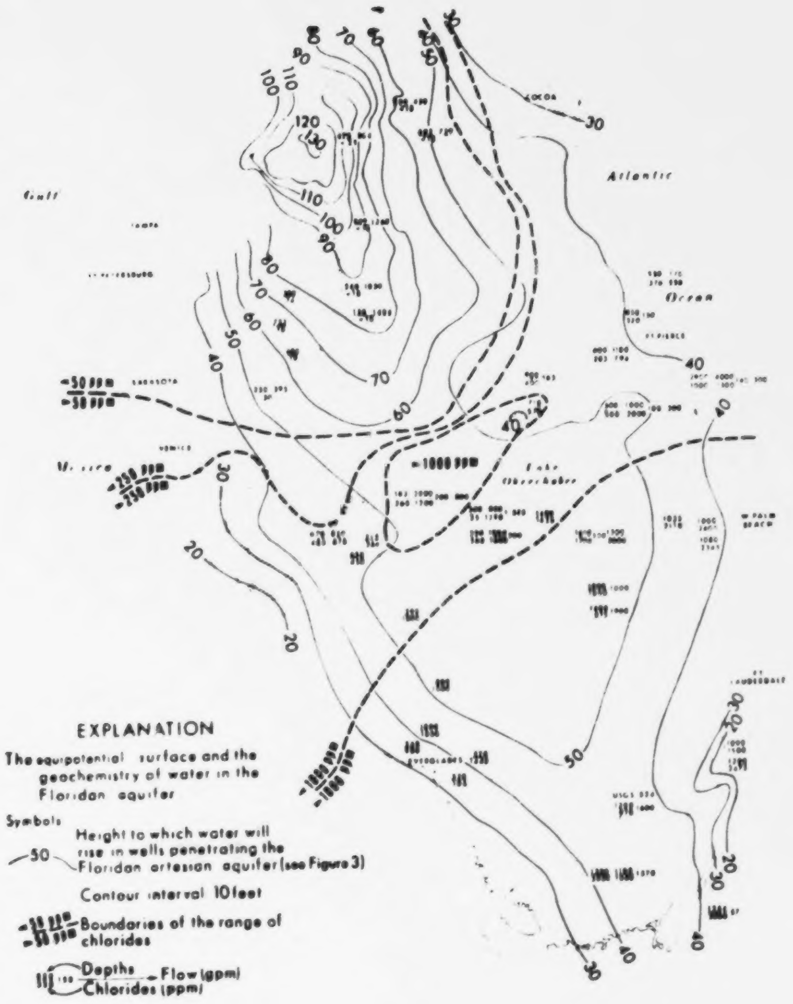

Atlantic
Ocean
Gulf
Mexico
Lake Okeechobee
Cocoa
Ft Pierce
W Palm Beach
Ft Lauderdale
Everglades
Sarasota
~50 ppm
~250 ppm
~1000 ppm
120
130
110
100
90
80
70
60
50
40
30
20
EXPLANATION
The equipotential surface and the geochemistry of water in the Floridan aquifer
Symbols
Height to which water will rise in wells penetrating the Floridan artesian aquifer (see Figure 3)
Contour interval 10 feet
Boundaries of the range of chlorides
Depths
Flow (gpm)
Chlorides (ppm)

Figure 5. The equipotential surface and quality of waters in the upper part of the Floridan aquifer.

ARTESIAN WATER

GENERAL

Recharge can occur most readily to the Floridan aquifer where the aquifer is exposed at or near the land surface at elevations above the level of the water in the aquifer. Large amounts of water also enter the aquifer where it is in contact with unconsolidated sediments that are saturated with water, or where sinkholes bypass the covering impervious layer.

The water that enters the aquifer is confined by an impervious layer, creating a water system under pressure. The equipotential surface, figure 5, represents the height, in reference to mean sea level, to which water would rise in wells that penetrated the aquifer in south Florida in 1961 (Healy, 1962). Modifications of Healy's equipotential surface were made to conform to the pressures encountered in wells recently constructed in the extreme distal end of Peninsula Florida.

The artesian pressure varies with response to the withdrawal of water from the system, pressures placed upon it by tides, earthquakes and the atmosphere, the amount of recharge, and several other minor factors. The primeval equipotential surface is probably present in south Florida along the elongated ridge that coincides with the length of the peninsula. Because most of the Floridan aquifer in panhandle and south Florida is remote from recharge areas, the aquifer in those areas does not respond to rainfall quickly, water moves slowly through the aquifer, there is little use of the water and the discharge is largely a result of seepage upward through the aquiclude, and into the adjacent oceans.

GEOCHEMISTRY

The artesian aquifer underlies all of Florida. Some of the water contained therein is not potable and figure 5 shows the general distribution of the chloride content of the water contained in the upper part of the aquifer in southern Florida, (Shampine 1965). The chloride content of ground water in the artesian aquifer is used as an index to the amount of sea water mixed with the fresh water. The water in the aquifer on the distal ends of both the panhandle and the peninsula exceed the tolerances for drinking water. Sea water normally contains up to 21,000 mg/l chloride, and public water supplies should not exceed 250 mg/l.

Large supplies of low quality water are available in south Florida from the Floridan aquifer and especially from the zones of high transmissivity near the base of the aquifer. Little use is made of this water in the area because of the availability of water of better quality in shallow aquifers and because of the relatively poor quality of the deep artesian water.

ZONES OF HIGH TRANSMISSIVITY OR THE "BOULDER ZONE"

Several cavernous sections, their locations and vertical distribution known from well logs throughout Florida, are mapped on figure 6, but in this paper an exceptional interest has been developed in the zone of high transmissivity that is generally present below 1200 feet throughout peninsular Florida.

The information developed from numerous wells drilled in the search for oil and gas indicates that the artesian system of Florida consists of fresh and brackish waters that rest upon and have depressed a dynamic, responsive body of heavily mineralized salty water. An enormously cavernous area with broadly developed transmissivities appears to have been formed approximately along the contact of the two bodies of water. These caverns are formed in dense dolostone that appears to be an effective aquiclude that restricts the vertical movement of water between the lower part (the "Boulder Zone") and the upper part of the Floridan aquifer. Well drillers report the free fall of bits of up to 90 feet, "lost circulation," cavities, and boulders. Cave-debris, and fragments dislodged into the caves in drilling, cause difficult drilling and the zone has become known as the "Boulder Zone."

From information available in the files of the Bureau of Geology, Florida Department of Natural Resources, this zone appears to respond as a part of the Floridan aquifer. It is best developed along the Atlantic Coast, but has been penetrated particularly in oil and water wells throughout south Florida, figure 6. Cavernous zones have been penetrated in more than 1500 wells throughout Florida, and cavernous areas vary in depth from 50 to more than 5530 feet, but these zones are present generally in eastern and southern Florida below 1200 feet. (See figures 5 and 6.)

The well penetrations at these depths enter a zone of dense dolostone that is cut by cavities generally less than 8 feet high. Little is known about the horizontal distribution of these caves. While extremely large transmissivities are suspected (in the order of several million gallons per day per foot), no pumping tests are available. The water quality and pressure heads present throughout the full thickness of the Floridan aquifer are revealed in some detail by two wells, one drilled at Coral Gables for Peninsula Utilities Company and one drilled at Belle Glade for the Sugar Cane Grower's Cooperative, both under the control of Black, Crow and Eidsness Laboratories, Gainesville, and constructed in cooperation with the State Board of Health and the Bureau of Geology, Florida Department of Natural Resources. These wells provide the most definitive and segregated data on the base of the Floridan aquifer. Black, Crow and Eidsness Laboratories Project Report No. 386-65R, December 1965, (p. 3) and No.

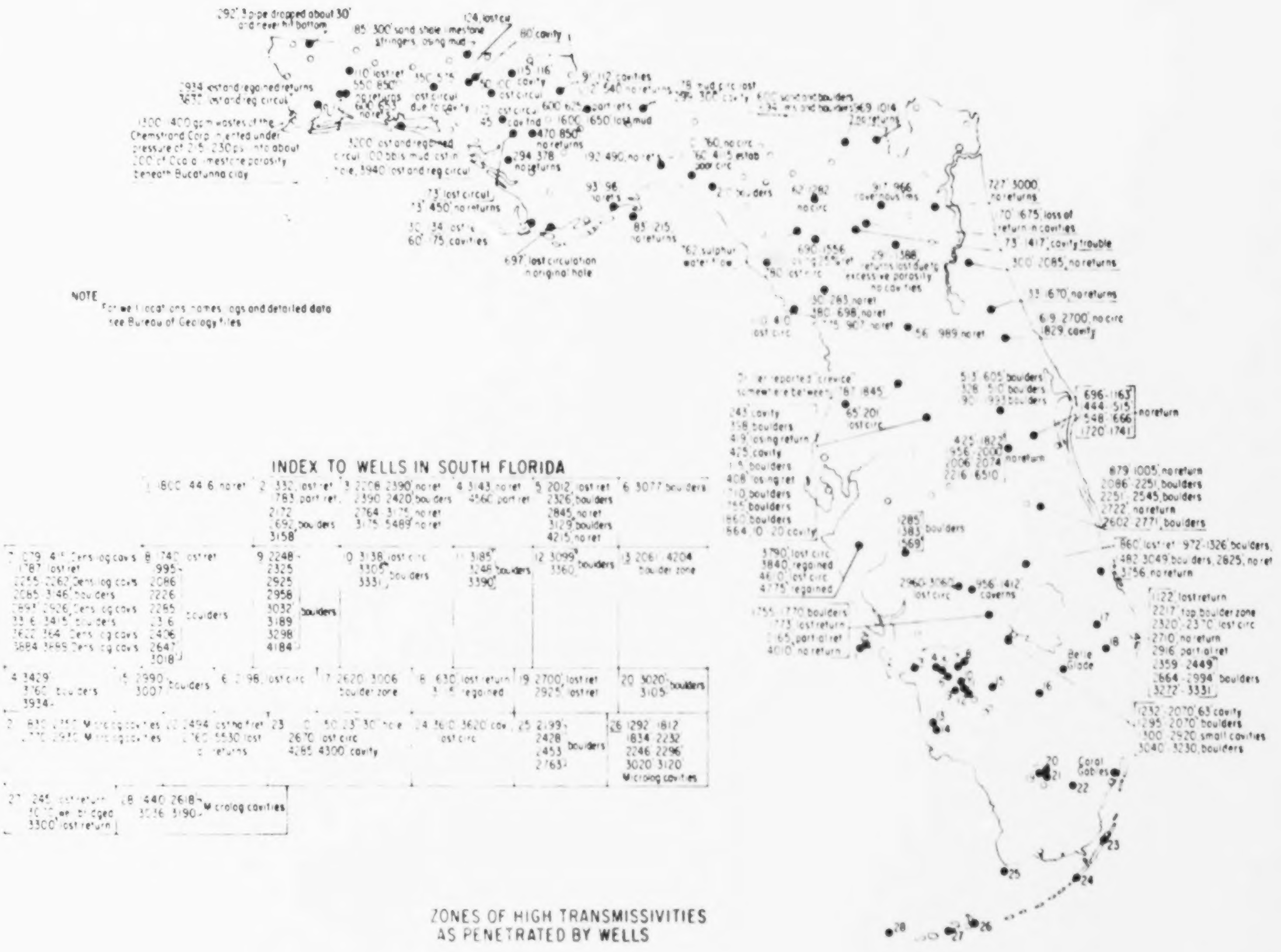

292' 3 pipe dropped about 30' and never hit bottom
185'-300' sand shale limestone stringers, losing mud
124' lost circ
80' cavity
2934' lost and regained returns
3630' lost and reg circul
110' lost ret
550'-850' no returns
600'-653' no ret
350'-575' lost circul due to cavity
115'-116' cavity
lost circul
91'-112' cavities
540' no returns
79' mud circ lost
300' cavity
600' sand and boulders
ims and boulders
969'-1014' 2.00 returns
1300-1400 gpm wastes of the Chemstrand Corp injected under pressure of 215-230 psi into about 200' of Ocala limestone porosity beneath Bucatunna clay
3200' lost and regained circul, 100 bbls mud lost in hole, 3940' lost and reg circul
600'-625' part ret
1600'-1650' lost mud
470'-850' no returns
294'-378' no returns
192'-490' no ret
760' no circ
415' estab poor circ
boulders
73' lost circul
13'-450' no returns
34' lost c
60'-75' cavities
697' lost circulation in original hole
93'-96' no ret
83'-215' no returns
762' sulphur water flow
280' lost circ
62'-1282' no circ
917'-966' cavernous lms
690'-1556'
1225' no ret
29'-1388' returns lost due to excessive porosity no cavities
727'-3000' no returns
170'-1675' loss of return in cavities
73'-1417' cavity trouble
300'-2085' no returns
33'-1670' no returns
619'-2700' no circ
1829' cavity
30'-263' no ret
380'-698' no ret
907' no ret
56'-989' no ret
410' lost circ
NOTE
For well locations, names, logs and detailed data see Bureau of Geology files
Driller reported "crevice" somewhere between 167'-1845'
65'-201' lost circ
243' cavity
358' boulders
419' losing return
425' cavity
boulders
408' losing ret
710' boulders
755' boulders
1660' boulders
1664'-1720' cavity
513'-605' boulders
328'-510' boulders
901'-933' boulders
696'-1163'
444'-515'
548'-1666'
1720'-1741'
no return
425'-1822'
1956'-2000'
2006'-2074'
2216'-6510'
no return
879'-1005' no return
2086'-2251' boulders
2251'-2545' boulders
2722' no return
2602'-2771' boulders
1285'
1383' boulders
1569'
3790' lost circ
3840' regained
4610' lost circ
4775' regained
2960'-3060' lost circ
956'-1412' caverns
860' lost ret
972'-1326' boulders
1482'-3049' boulders, 2825' no ret
3756' no return
1755'-1770' boulders
1773' lost return
3165' partial ret
4010' no return
1122' lost return
2217' top boulder zone
2320'-2370' lost circ
2710' no return
2916' partial ret
2359'-2449'
2664'-2994' boulders
3272'-3331'
1232'-2070' 63 cavity
1295'-2070' boulders
1300'-2920' small cavities
3040'-3230' boulders
Belle Glade
Coral Gables
INDEX TO WELLS IN SOUTH FLORIDA
1 1800'-4416' no ret
2 1332' lost ret, 1763' part ret, 2172'-2692' boulders, 3158'
3 2208'-2390' no ret, 2390'-2420' boulders, 2764'-3175' no ret, 3175'-5489' no ret
4 3143' no ret, 4560' part ret
5 2012' lost ret, 2326' boulders, 2845' no ret, 3129' boulders, 4215' no ret
6 3077' boulders
7 1079'-1415' Dens log cavs, 1787' lost ret, 2255'-2262' Dens log cavs, 2085'-3146' boulders, 2891'-2926' Dens log cavs, 3316'-3415' boulders, 3622'-3641' Dens log cavs, 3684'-3695' Dens log cavs
8 1740' lost ret, 1995'-2086', 2226'-2265', 2316'-2406', 2647'-3018' boulders
9 2248'-2325', 2925'-2956', 3032'-3189', 3298'-4184' boulders
10 3138' lost circ, 3305'-3331' boulders
11 3185'-3248'-3390' boulders
12 3099'-3360' boulders
13 2061'-4204' boulder zone
14 3429'-3760' boulders, 3934'
15 2990'-3007' boulders
16 2198' lost circ
17 2620'-3006' boulder zone
18 1630' lost return, 3116' regained
19 2700' lost ret, 2925' lost ret
20 3020'-3105' boulders
21 1830'-2750' Microlog cavities, 2770'-2930' Microlog cavities
22 2494' lost no ret, 2760'-5530' lost returns
23 2670' lost circ, 4285'-4300' cavity
24 3610'-3620' cav, lost circ
25 2199'-2428', 2453'-2763' boulders
26 1292'-1812', 1834'-2232', 2246'-2296', 3020'-3120' Microlog cavities
27 1245' lost return, 3010' well bridged, 3300' lost return
28 1440'-2618', 3036'-3190' Microlog cavities
ZONES OF HIGH TRANSMISSIVITIES AS PENETRATED BY WELLS

Figure 6. Zones of high transmissivity.

498-70-53, February, 1970 records several zones of pressure, generally contained in porous limestone separated by dense dolostones, as shown in figures 7 and 8. The company's "Engineering Report on drilling and testing of a deep Disposal Well for Peninsula Utilities Corporation, Coral Gables, Florida" (Project 498-70-53, dated February, 1970) records the gamma ray, electric log, geologic log, flow, caliper, and the temperature, specific gravity and chloride concentrations in at least three aquifers separated by aquicludes. A zone of high transmissivity was entered at about 2920 feet.

Observed drops in pressure at Belle Glades in the zones: 1105-1420, 1610-1900, and 1900-1945, of 20, 18, and 14 pounds per square inch correspond to increases in salinity (chlorides) and represents the adjustment of the hydrostatic head to the increased density of the column of water in the well bore. These differentials, when adjustment is made to give an equivalent head in feet of fresh water, indicate a gradient toward the ground surface throughout the geologic column, and the development of a large cone of depression in the upper part of the aquifer could cause the ultimate movement of water from the base toward the ground surface, unless 1.) the large part of the water needed to maintain the flow of the wells is obtained through the spread of the cone of depression up-gradient to intersect less mineralized water, 2.) the horizontal permeability is large in respect to the vertical permeability, and 3.) there is an effective aquiclude that separates the upper part of the aquifer from the lower part.

A similar gradient to the surface exists in the subsurface at Coral Gables (fig. 8) to a depth of 1840 feet, but below this point the specific gravity of the water approaches that of the ocean and the pressures are static, except when fresh water is injected and displaces the salt water to create a gradient toward the surface developed from the injected body of fresh water.

Only a limited amount of information is available on the Floridan aquifer in the distal part of the peninsula, since ground-water use and studies have been limited to shallow sources and to areas where the artesian water is potable.

This is particularly true of zones of high transmissivities along the base of the aquifer (the "Boulder Zone"), which may range in depth from 1200 to more than 5500 feet. However, the Floridan aquifer is known to be composed of a thick section of carbonates (limestones and dolostones), which vary in transmissivity, generally decreasing upward from the cavernous, extremely permeable lower part. The zones of permeability are separated by zones of dense, impermeable rock although an irregular permeability may be present along fractures and in favorable geologic facies within these aquicludes.

If the data developed from the two deep wells in south Florida by Black, Crow and Eidsness Laboratories and the Bureau of Geology, and summarized in

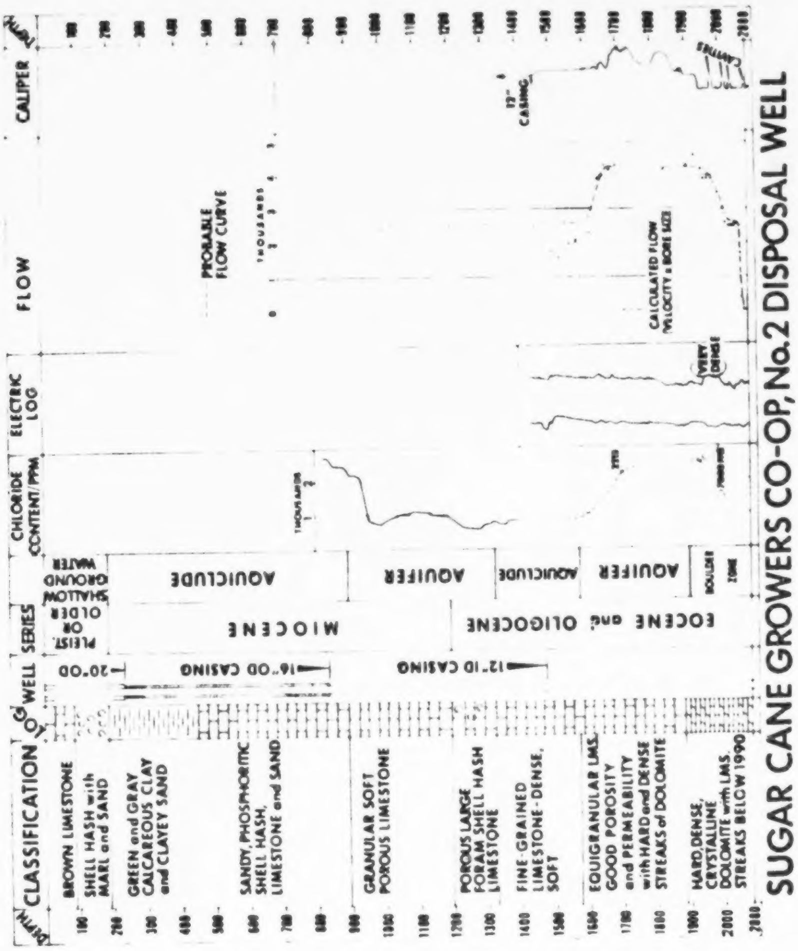
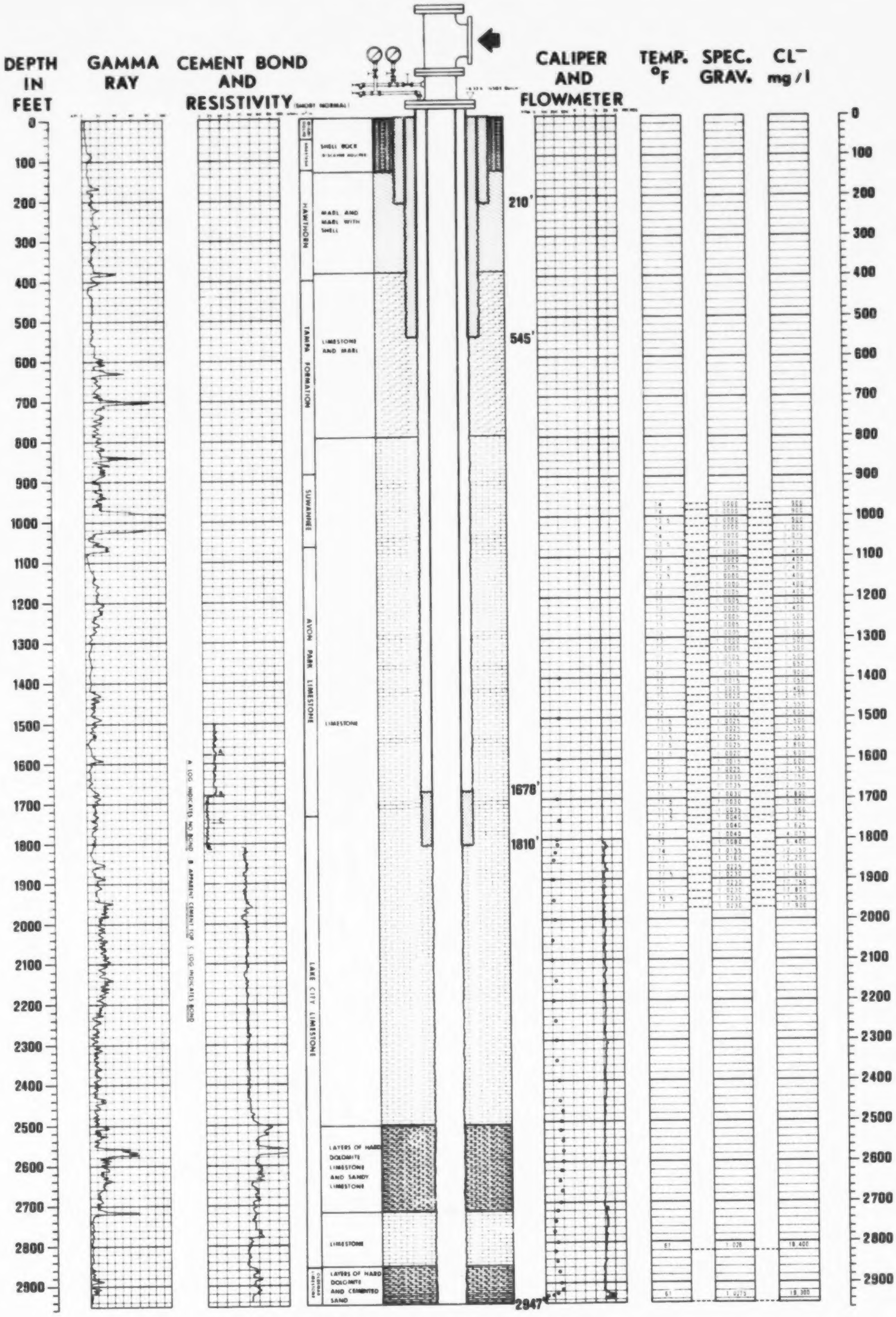


Figure 7. Belle Glades log and data.

SUMMARY OF DATA FROM DRILLING AND RELATED OPERATIONS
DISPOSAL WELL, PENINSULA UTILITIES CORPORATION, CORAL GABLES, FLORIDA

BLACK, CROW AND EIDSNESS, INC.
Engineers



Blue Shading Indicates Water Bearing Formations figures 7 and 8, can be considered to be representative of the aquifer throughout southern Florida, a thick section of carbonates forms at least three general zones of permeability that may be poorly connected. At the base is a zone of extremely high transmissivity, filled by highly saline waters (up to 19,300 mg/l chlorides) and separated by denser sediments from a zone of moderately high transmissivity containing water of 1000 mg/l or less. Many cavities in the lower part of the aquifer produce copious flows of salt water, or may be made to receive large volumes of injected fluids.

The mechanics of the formation of these zones of high permeability have been the source of much speculation.

F.A. Kohout (1965) postulated a cyclic flow of cold sea water into the artesian aquifer from oceanic deeps that, by mixing with fresher water and being heated by earth temperatures, creates a heat convection cell, providing the energy to return the flow to the sea. Kohout cited a number of temperature inversions taken from oil well logs as proof of this hypothesis. Unfortunately these proved to be cement logs and the higher temperature excursions represent a plot of the heat of crystallization that locally has been superimposed upon the normal temperature gradient. An accurate temperature survey was made in the Sunoco-Felda Field using the Sun Oil Company No. 32-3 Red Cattle Company well after several years of temperature stabilization. The record is reproduced as figure 9, and in September, 1969 the ground water from 900 to 2100 feet had a temperature gradient of one degree for each 122 feet. From 2100 feet to 3300 feet, through the "Boulder Zone", the gradient is only one degree for each 480 feet, the reverse of that reported by Kohout. A most interesting thermal gradient exists along the Atlantic Coast and the presence of "cool wells" have been known for many years. Instead of the normal temperature excursions of about 1° F. increase per 100 feet of depth, the gradient decreases about 1° F. for each 250 feet and in the Coral Gables well (fig.8) a sharp temperature inversion (1° F. in 24 feet) occurs at about 2800 feet, where a large cave was penetrated and where the formation water is essentially the same as sea water. These cold wells are thought to reflect the loss of heat in the aquifer to cold water of the adjacent deep oceanic waters (see Black, Crow & Eidsness, Inc., p.4-5). Since no head exists at that depth, no flow and exchange of water with the ocean would be expected. Cooler temperatures are to be expected in zones of large solutional caverns where larger volumes of water and increased velocities of flow are present, when compared to zones of lower transmissivities;

A more reasonable explanation of the origin of such zones involves hydraulic scour along the interfaces of fluids that contain differing concentrations of electrolytes in an artesian system. The greatest differential would occur along the base of the aquifer where fresh water and brines mix, but can be expected to occur along any interface where large differences in transmissivities lie adjacent.

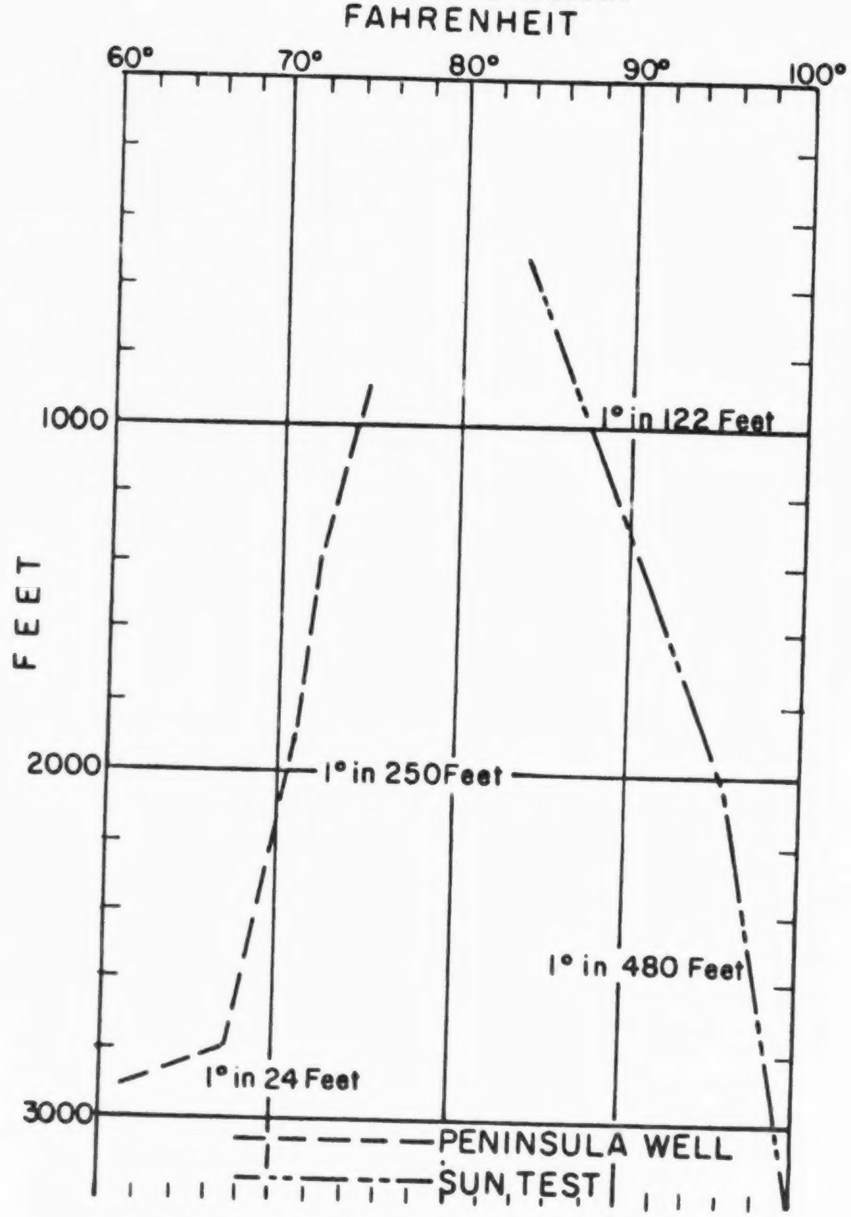


Figure 9. Temperature survey.

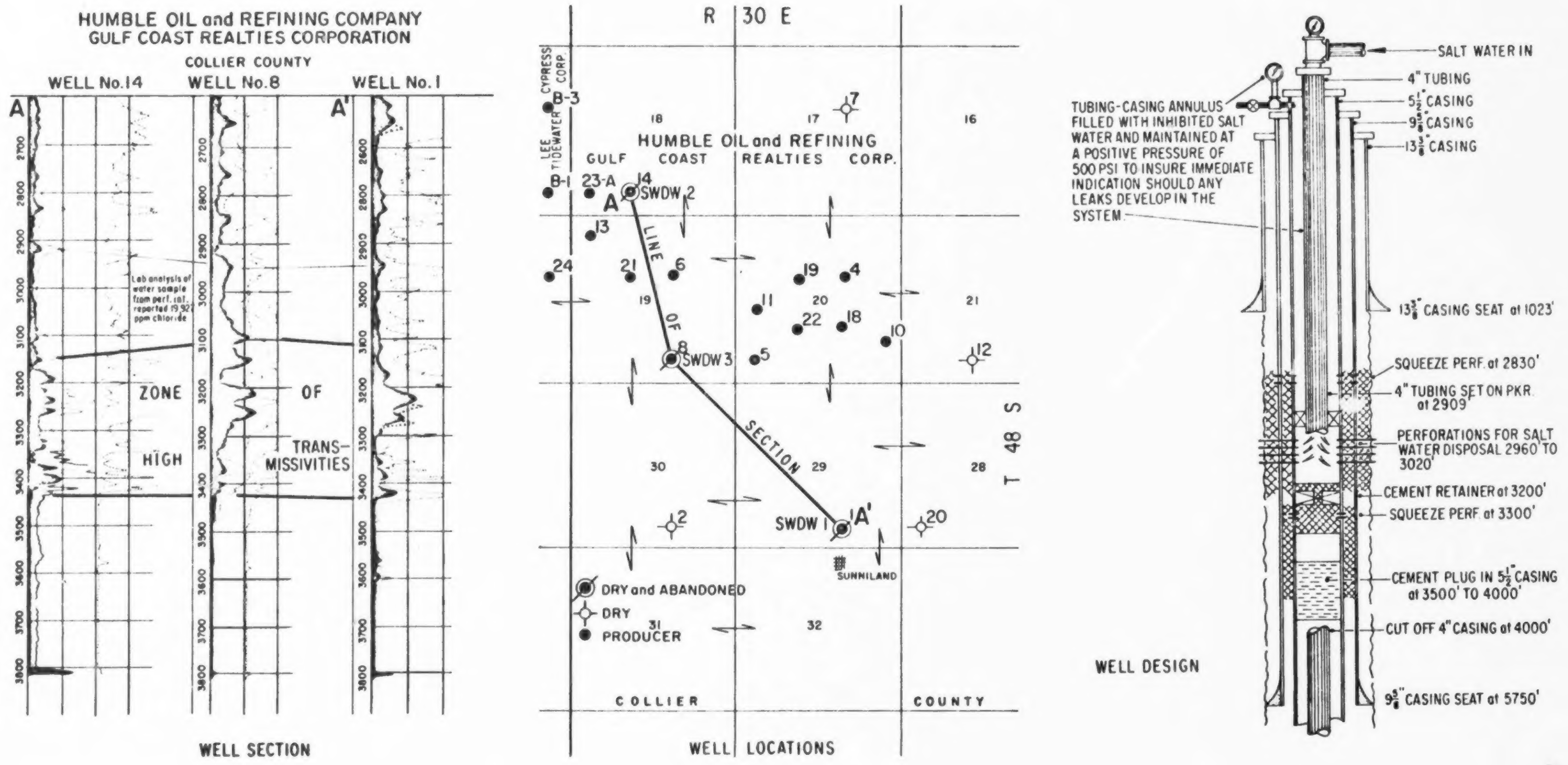

HUMBLE OIL and REFINING COMPANY
GULF COAST REALTIES CORPORATION
COLLIER COUNTY
WELL No.14
WELL No.8
WELL No.1
A
A'
Lab analysis of water sample from perf. int. reported 19,92? ppm chloride
ZONE
OF
HIGH
TRANS-MISSIVITIES
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
WELL SECTION
R 30 E
T 48 S
LEE TIDEWATER CYPRESS CORP.
B-3
B-1
23-A
GULF COAST
HUMBLE OIL and REFINING REALTIES CORP.
14
SWDW 2
SWDW 3
SWDW 1
LINE OF SECTION
16
17
18
19
20
21
28
29
30
31
32
2
4
5
6
7
8
10
11
12
13
18
19
20
21
22
24
SUNNILAND
DRY and ABANDONED
DRY
PRODUCER
COLLIER
COUNTY
WELL LOCATIONS
SALT WATER IN
4" TUBING
5½" CASING
9⅝" CASING
13⅜" CASING
TUBING-CASING ANNULUS FILLED WITH INHIBITED SALT WATER AND MAINTAINED AT A POSITIVE PRESSURE OF 500 PSI TO INSURE IMMEDIATE INDICATION SHOULD ANY LEAKS DEVELOP IN THE SYSTEM
13⅜" CASING SEAT at 1023'
SQUEEZE PERF. at 2830'
4" TUBING SET ON PKR. at 2909'
PERFORATIONS FOR SALT WATER DISPOSAL 2960' TO 3020'
CEMENT RETAINER at 3200'
SQUEEZE PERF. at 3300'
CEMENT PLUG IN 5½" CASING at 3500' TO 4000'
CUT OFF 4" CASING at 4000'
9⅝" CASING SEAT at 5750'
WELL DESIGN

Figure 14. Correlation of stratigraphic section in South Florida.

In an aquifer composed primarily of limestone with minor amounts of dolostone and some gypsum, Back (1963), Hanshaw, et al (1965) and Back, et al (1966) found water taken from depths of several hundred feet to be undersaturated within a large part of the aquifer. This indicates that solution can occur throughout much of the aquifer, several hundred feet below the water table, to form caverns and solution channels.

The calcium-magnesium ratios, determined from waters taken by flow through the drill stem, when drilling the Peninsula utilities well, when plotted against depth show a straight-line plot of about .55 from about 1500 to a depth of 1800 feet. Marked migrations to a ratio of about .3 occurs at the top of the Floridan aquifer and across the contact of essentially fresh or salty water at 1800 feet.

In a series of wells, samples across recharge-discharge areas, the writers cited above found that the total dissolved solids, sulphates, and Mg:Ca ratios increased away from recharge areas, and may become supersaturated with respect to some solid phases. The degree of saturation was related to the length of flow path and duration of residence time in the aquifer. Ground-water velocities were reported to be about eight meters per year.

These studies did not incorporate suggestions made by Vernon (1947, 1951) that the effect by artesian water upon soluble aquifers is expressed in a greater flushing action and increased porosity, not only in recharge areas where rapid solution occurs along the water table, but throughout the aquifer and into discharge areas where porosity is expected to increase toward the ground surface. Dr. A. P. Black (Personal Communication, 1950) reported the recovery of free oxygen, carbon dioxide, and sulphur dioxide from artesian water at Jacksonville. This suggested that in discharge areas the lowering of pressure and the cooling of water, by upwelling, releases gases from solution and causes the undersaturation of dissolved solids and permits added solution and diagenesis. The localization of this solution was projected as a mechanization for the formation of natural wells and deep sinkholes (Vernon, 1951, p. 44) and may help to explain the dolomitization of carbonate sediments located over the areas of structural uplift and relief.

In an excellent paper, Runnells (1969) presented a number of solubility curves. Three of these, compiled by Runnells from several works, include a plot of calcium ion against CO_2 pressures, a theoretical plot of added electrolytes and solubility of calcite as a function of sodium chloride. These are reproduced as figures 10,11, and 12. From a study of the geochemistry of solids and fluids in various systems, Runnels concluded that dissolution and precipation of a mineral will occur in nature as a result of the mixing of formation fluids whenever the

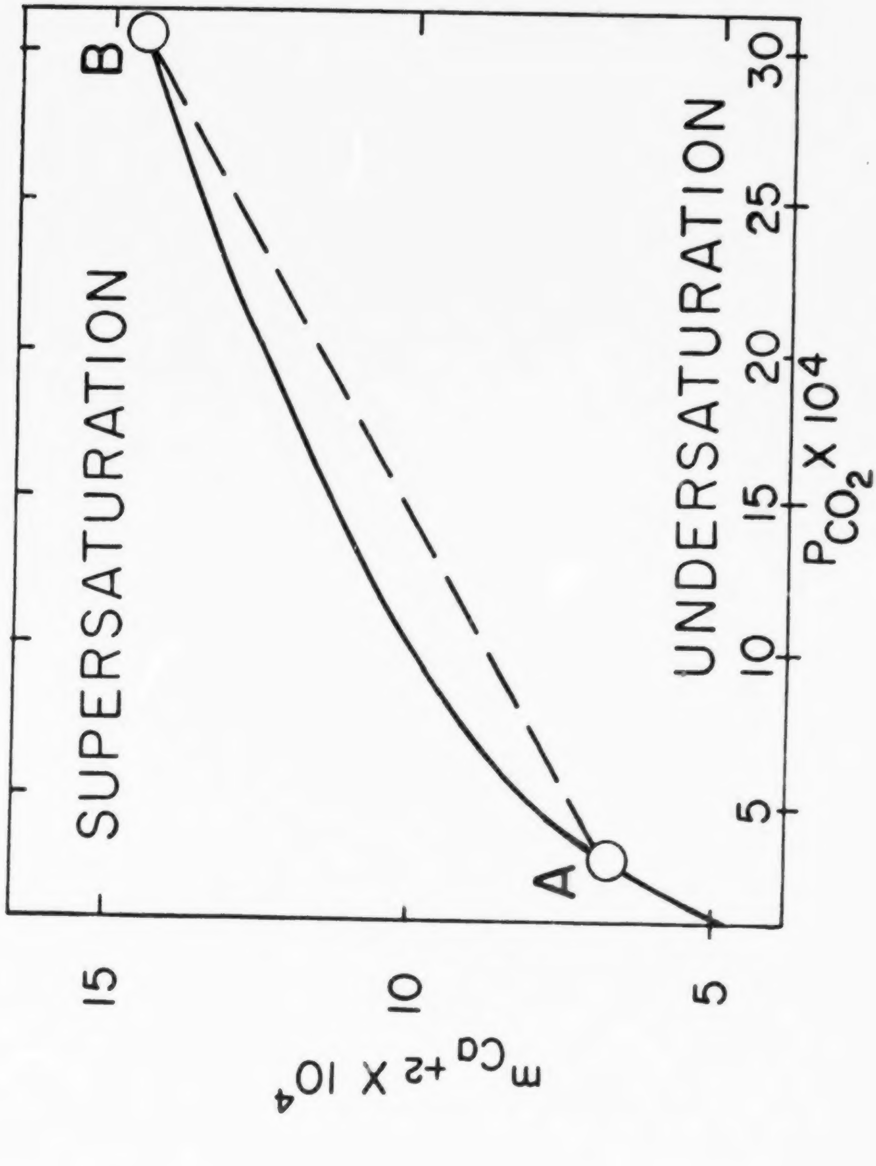


Figure 10. Calcium against CO_2.

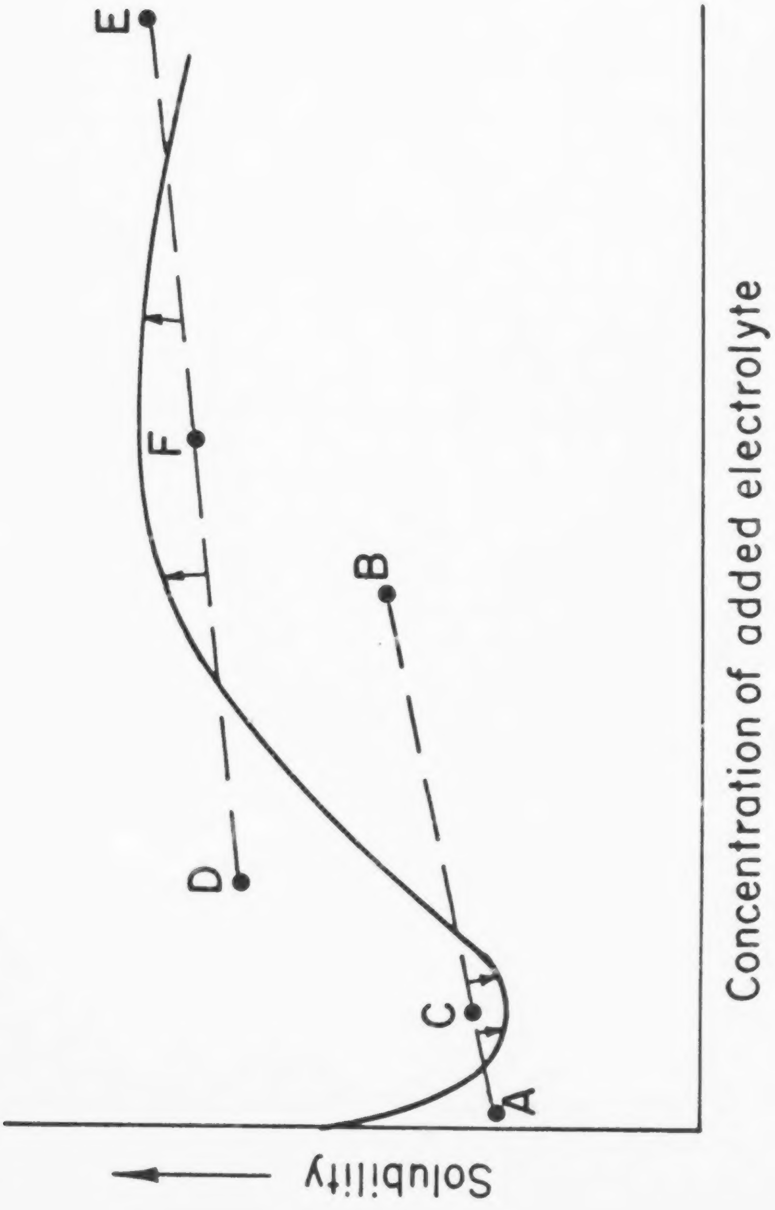


Figure 11. Electrolyte concentration and solubility.

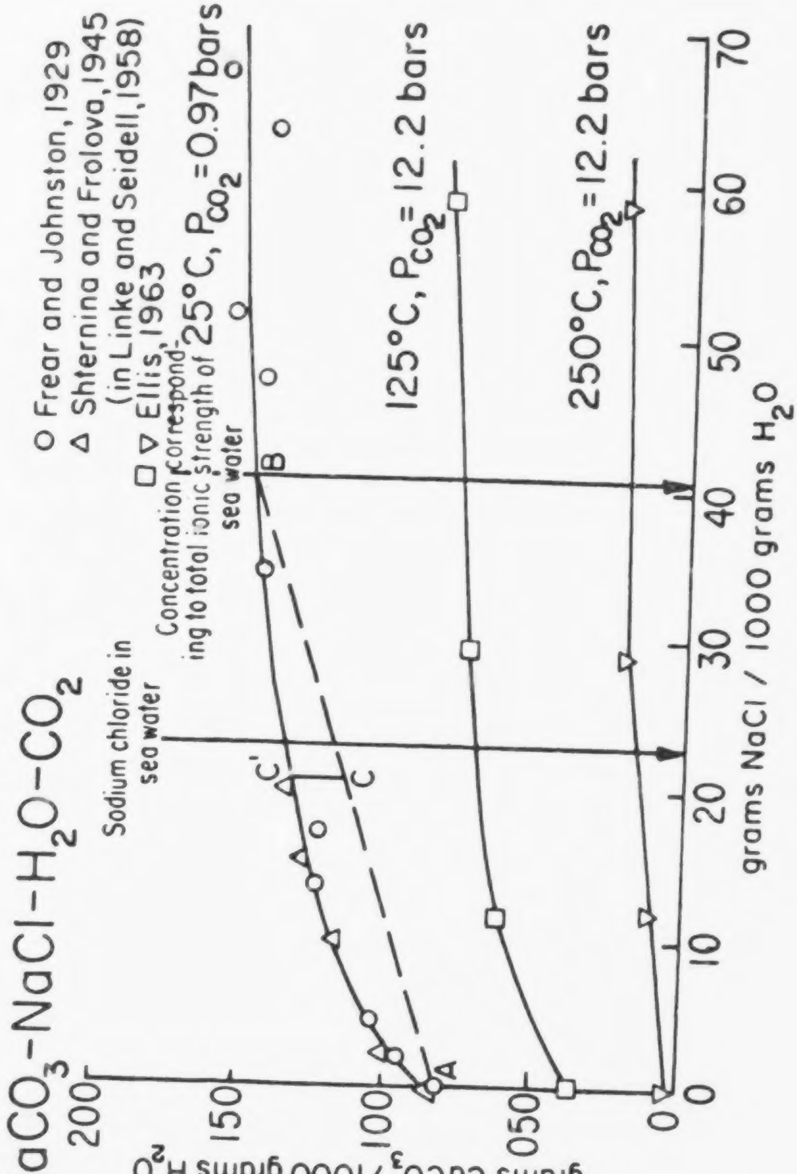


Figure 12. Calcite as a function of sodium chloride.

solubility of the mineral is a non-linear function of added salts. Although emphasizing the content of salts as the variable of greatest interest in his studies of water he noted (1969, p. 1198):

> "...mixing of water in which other parameters differ may also be important. For example, mixing of water of different temperature, pressure, pH, content of dissolved organics, partial pressure of gases (Mischungskorrosion), and so on, may also cause changes in the state of saturation. Only if the solubility of a mineral is a straight line function of a given independent parameter will mixing result in a water which remains at equilibrium with the adjacent solids."

One obvious result of mixing along the base of Florida's carbonate system could be the depostion of the more insoluble minerals (dolomite and quartz) and the removal of the more soluble ones (gypsum, calcite, and aragonite). The mixing of artesian-derived calcium-bicarbonate water with brine-derived calcium sulfate water favors the precipation of gypsum because of the common ion and could explain the impregnation of porsity by gypsum commonly present at the base of the aquifer.

Depending upon the chemical composition, and the degree of concentration of the variables in the waters that are mixed along the interfaces of artesian waters circulating downward, particulary that created as the artesian water depresses the salt water, as envisioned in the generalized section of figure 13, an infinite number of mixed systems could be created in which precipation will occur in solutions supersaturated as to the solid phase and dissolution occurs in undersaturated solutions.

Vernon (AIME Preprint, 1969, p. 8) suggested such a system in the Floridan aquifer, and Runnells (1969, p. 1196) in commenting on this reported presence of high transmissivities and dolomite along the contact of fresh and saltier water, stated:

> "This is precisely the natural situation which would be predicted from a consideration of the mixing of sodium chloride waters in the presence of limestone and probably dolomite".

Dissolution or precipitation of a mineral should occur whenever waters that traverse the rock are mixed and result in the mixed liquid becoming undersaturated or oversaturated as to the rock. Runnells' solubility curves illustrate that erosion or deposition is possible only when the solubility curve plots as non-linear function. In figure 11 for instance, a mixture of waters A & B will cause precipitates within the area at C and a mixture of waters D & E will result in dissolution of the matrix where the mixed fluids plot within the arc at F.

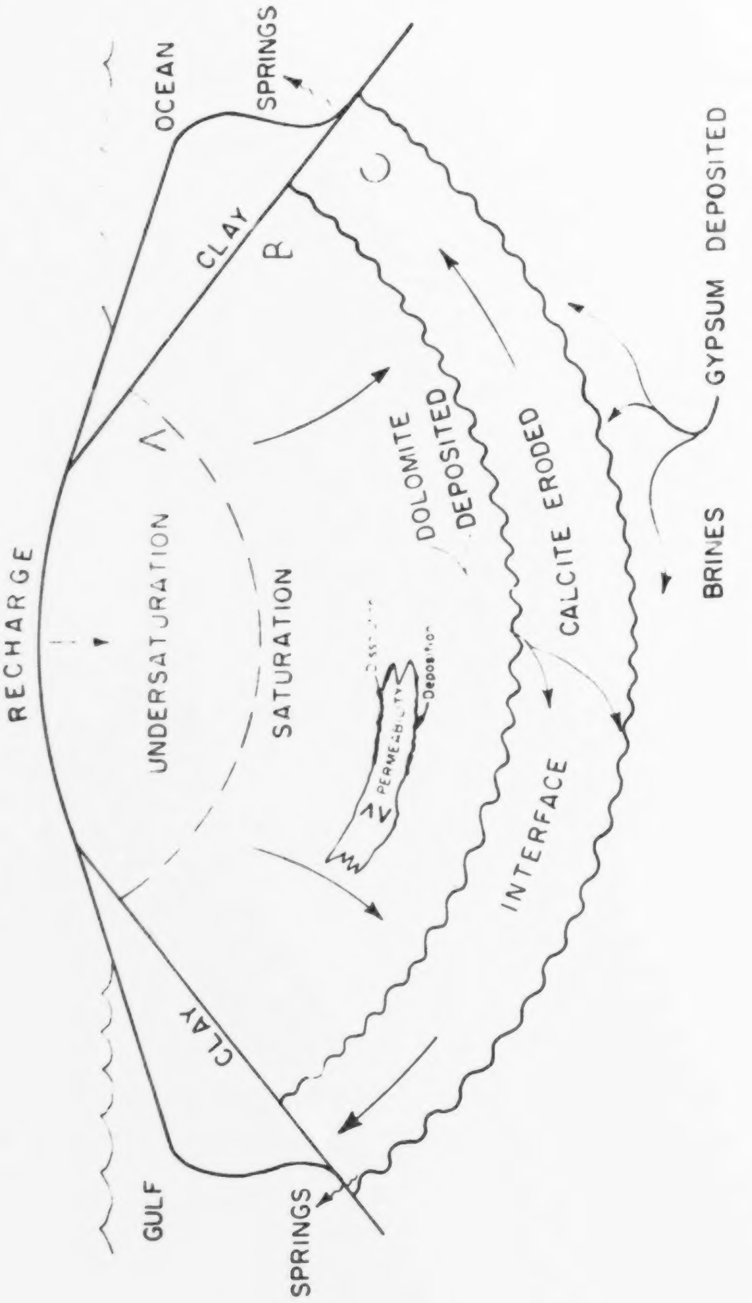

RECHARGE
UNDERSATURATION
SATURATION
A
B
C
CLAY
CLAY
OCEAN
GULF
SPRINGS
SPRINGS
DOLOMITE DEPOSITED
CALCITE ERODED
INTERFACE
BRINES
GYPSUM DEPOSITED
PERMEABILITY
Dissolution
Deposition

Figure 13. Generalized cross-section of Geohydrology.

Florida receives recharge into an extensive artesian system that rests upon salty water close to sea water in quality but up to 10 times as salty as sea water in zones of deep penetration. A mixed zone separates the brines from the fresher water. The base of the aquifer is commonly marked by the total elimination of porosity in the aquifer with impregnating gypsum. Persistent zones of high transmissivities lie within the mixed water zone. Large cave systems, showing dolomite crystal growth upon the cave debris and along the walls, suggest that Runnells' hypothesis may be fully effective, with the cavities representing the cycle of dissolution or undersaturation and the dolomite and gypsum representing the cycle of deposition and supersaturation. A sample of cave-debris dolomite was analyzed by Dr. Bruce Hanshaw of the U.S.G.S. and he reported (letter January 20, 1970) as follows,

> "We have examined the stable carbon isotope composition of calcite-dolomite pairs from well cuttings which you provided us. Interestingly, we find that the calcite $^{\Delta}C^{13}$ composition is always that of normal marine limestone. However, to our surprise, the $^{\Delta}C^{13}$ of the associated dolomite is invariably depleted in the heavy stable isotope of carbon and this indicates that the dolomite did not form in a marine environment. We believe that this dolomite is not forming today but that it has formed under the effect of some type of ground water, perhaps saline (?) in the geologic past. Our findings are in agreement with the ideas you expressed in the AIME papers concerning dolomitization in the Boulder Zone."

The distribution of several zones of high transmissivities, the shape, and vertical range of the cavities reflect an origin of dissolution rather than temperature control. The zones of mixing, and associated dissolution, would also reflect the location of several such zones in the section, some as deep as a 15 foot cavity from 4285-4300 feet in the Coastal-Williams well in Dade County and some above the present water table, such as in Orlando and in Ocala. The varying elevations in cave systems reflect possible changes in the level of the ocean upon the land, and the subsequent adjustment of ground-water to these changes.

Field and laboratory data suggest that, where the recharging water having varying concentrations of ions traverses alternating zones of rock, several zones of dissolution and precipitation could occur throughout the carbonate system. Only an artesian head is necessary for the needed circulation.

It is suggested that a system such as shown in figure 13 has existed several times in the geologic past and now exists in Florida. For instance, in the area of active karst (Zone A), the fluids would be undersaturated for most solid phases, in Zone B the solid phases would be saturated in the fluids and in Zone C, where relatively fresh waters rest upon relatively briny water, mixing of the two waters creates undersaturation for some salts and supersaturation for others that vary in quantity and place with the resulting dissolution and precipitation. Thus gypsum is found to occupy the pores of the rock below the mixed zone according to the kind and degree of inequilibrium. Dolomite is replacing calcite, which is removed along the mixed zone to create the large transmissivities and to form dolostone walls and cave debris and to build euhedral crystals of dolomite upon the exposed faces of the cave and debris.

DEVELOPMENT OF DATA FOR PERMITTING

The regulation, installation and operation of a well-injection system requires the development of data that will meet the administrative needs, permit the geologic and hydrologic evaluation of the site and satisfy all professional and engineering requirements. A feasibility study should be prepared by the applicant to include:

1. A land-use plan with statement of any conflicting interest and projections of growth and need.

2. The determination by the applicant, in concert with appropriate State agencies, of the general characteristics of the hydrology and geology at the proposed site and of the suitability of the wastes for disposal.

3. An application to the Department of Air and Water Pollution Control Commission for a permit to construct a test-well and to develop parameters controlling the use of this well for injection. A flow-sheet of the plant operations should be included and the proposed plan should be detailed and documented.

4. The drilling, testing, and evaluation of a test-well under the supervision of a professional engineer and personnel of the Bureau of Geology. Samples of the cores and cuttings and logs of the flow, conductance, temperature, caliper and electric characteristics, prepared by a service company or by the Bureau are required.

Following the evaluation of all the pertinent data submitted under the feasibility study, and the approval of the project by the appropriate state agencies, the applicant may:

1. Petition for use of the test well as an injection well based on the information developed by the test well and he may also choose to use the test well to monitor. Adequate sets of casings, seals, grouting and protective monitoring devices must be shown.

2. Establish specifications for a stand-by alternate injection-well, located down gradient and constructed so that it can be used as a deep-monitor to the injection zone.

3. Design wells for monitoring the injected fluids to include a deep well and a well that terminates in any aquifer containing fresh water (less than 5,000 mg/l chlorides) that rests upon the injection zone. An alternate method of monitoring the shallower aquifer can be developed in the injection and stand-by wells through the use of casing to separate the zones and permit the monitoring to be done in the annular space between casings.

4. Suggest a scheduled method of recording and reporting the results of quality monitoring of the injected fluids, the fluids recovered from the deep-monitor and that from a shallow monitor. The quality monitoring shall be accompanied by a record of the amounts of fluids injected and by a system of pressure monitoring throughout the injection works.

5. Should the injection well be used and then fail because of structural damage or because there is no futher need for its operation, the well must be abandoned in accordance with specifications adopted by the Department of Air and Water Pollution Control Commission, with recommendations of the Bureau of Geology.

Florida has only two industrial water injection wells and its pollution problems appear to be largely that of disposal of municipal wastes. If deep-well injection is to be used to relieve the state's surface waters of this pollution, all wastes should receive secondary waste treatment and in addition, advanced waste treatment, when required by the pollution-control regulatory agency.

Periodic reviews of the injection-well system and procedures should be directed to the adequacy of the subsurface to receive and to remove the remaining nutrients, biotics, and virulent residues and to return the water to a quality that meets the requirements for other uses. The review should also be directed to the need for decreased or increased pre-treatment, prior to injection.

Deep wells, receiving injected treated wastes, should terminate in zones of high transmissivities that are filled by saline or unusable waters. Such zones are located in the base or below the Floridan aquifer and are reasonably separated from useable waters by dense sediment with low or minimal vertical transmissivities.

The fluids of the injection zone shall be compatible with the injected fluids or they can be made so, by the use of a buffer zone.

For emphasis, I repeat that all injection facilities must be properly engineered and designed to resist corrosive fluids and to transport the fluid under the designed hydraulic pressures without failure. The well must be constructed with the use of service companies and under the supervision of a professional engineer and a certified geologist.

DEEP-WELL INJECTION IN FLORIDA

Only six deep wells have been constructed in Florida to dispose of wastes by injection. Five of these; three oil brine disposal, one sewage, and one industrial; use cavernous areas in the base of the Floridan aquifer. The sixth well injects an industrial waste into the Floridan aquifer at Pensacola where the water is highly saline.

BRINE DISPOSAL WELLS

In 1943 Humble Oil and Refining Company discovered the first oil in Florida and developed the Sunniland Oil Field in Collier County. An immiscible mixture of oil and brine occurs along the margins of the oil accumulation and most wells produce some salt water--- many produce more water than oil. The oil is separated at the field from the brines which are stored in tanks temporarily.

Because these brines (analyzing in excess of 120,000 milligrams per liter solids) could not be released to surface streams, the Department of Natural Resources found, after public hearings (1943, 1969) that:

> "1. Brine is produced with hydrocarbons from wells in the Sunniland Field
>
> 2. Volumes being produced are large
>
> 3. Salt water should be disposed of in a manner that will not be harmful to the area
>
> 4. The Humble Company owned several wells that could be used for disposal of these brines to the subsurface
>
> 5. The water at depths between 2950-3220 is highly permeable and contains water in excess of 19,900 parts per million of salinity."

Therefore, the Gulf Coast Utilities No. 1, No. 8, and No. 14 wells were recompleted to develop injection wells that open to cavernous sections. A series of casings had been cemented in the wells and the cavernous areas were isolated by cement plugs placed above and below the zone, and the casings were perforated opposite zones of high transmissvities. The annular spaces between the casings (13 7/8", 9 5/8", 5 1/2, and 4") are monitored by means of water levels and pressures to guard against casing failures, figure 14. The Gulf Coast Realties Corporation No. 1, was operated as a salt-water disposal system for many years and it was plugged when No. 14 and No. 8 were placed on stream.

This system has been in operation since discovery of the Sunniland Field in 1943, with no contamination of the State's freshwater resources. Because of the high specific gravity of the brines, it is possible to siphon the fluids from the storage tanks into the wells, where the heavier water settles to the base of the cavernous zones. About 170,000 barrels or about 7 millon gallons of brines per month are disposed of in this manner.

INDUSTRIAL WASTE INJECTION

Since 1953, the Chemstrand Company, north of Pensacola, Florida, has manufactured nylon and the resultant wastes have been reduced through holding pits, employing activated sludge and bio-oxidation, the final effluent being discharged to the Escambia River. Because the ability of the River to absorb these wastes was limiting production, the company sought a better and safer method of disposal. The United States Geological Survey and the Bureau of Geology were engaged in a study of the geohydrology of the area in 1961, and had found that an excellent aquifer, filled with salty water (13,000 mg/l chlorides) lay beneath the plant, and the aquifer was positioned between thick clay beds that made effective vertical barriers. (See Marsh, 1966, p. 19). Accordingly, the company was encouraged to consider the construction of an injection well (1808 feet deep) and monitoring system (Shallow well - 1140 feet, and a deep well - 1650 feet deep) in 1961. The first use of this system was in July 1963, when 400 gpm of acid wastes, neutralized by ammonium-hydroxide, were injected at about 350 psig of pressure. The original specific capacity of 1.3 gpm has been increased by dissolution of the limestone reservoir to the point where the well now receives in excess of 1000 gpm at 200 psig.

Initially the wastes were neutralized to a pH of about 6.0, but in April of 1968, the State Board of Health permitted the temporary injection of the waste without neutralization at a pH between 1.8 and 4.2. There have been no changes in pressure or quality in the shallow monitoring well but the deep monitoring well recorded significant increases in calcium and nitric acid.

Two monitor wells, a shallow and a deep well, were drilled to evaluate the effects of injection, determine further geohydrological data and to prevent pollution. In 1965 a second injection well was drilled to a depth of 1654 feet for stand-by and monitoring. The shallow well was drilled to the base of the upper aquifer, 100 feet from the injection well, where the greatest pressures and greatest danger of breaking the top clay seal existed. The second monitor and the injection well extends 1650 feet, into the reservior that receives the wastes, and are 1300 feet from each other. In 1968 one of the deep monitoring wells was abandoned because of corrosion of the well casing and it was plugged. It was replaced by two deep wells each about 1500 feet deep, one being located two miles north, the other one mile south of the injection site.

The injection well is cased with coated iron pipe, and fluids are introduced through a stainless steel liner. The space between the liner and the casing is filled by diesel oil. Pressure gauges are read daily of fluids placed in the annular space, and at all wells. Specific quality controls of the wastes and of all wells are run daily and total quality determinations are made monthly. Occasional manipulation of the system by adding tracers and backflushing permits the development of transmissivity and other formation factors, flow rates and geochemical changes.

The movement of these wastes is expected to be downgradient to the south at a slow rate. After five years of injection at a rate of about 2.3 mgd the injected fluids have been calculated (U.S. Geological Survey, January 3, 1969) to lie within 1.1 mile of the injection field. A study and analysis of the geochemistry of the monitoring program is being prepared by the U.S. Geological Survey.

The second industrial injection well is located at a furfural plant at Belle Glade, Florida and was engineered by Black, Crow and Eidsness, Inc. of Gainesville, Florida with the assistance of the Bureau of Geology and State Board of Health. The data relating to this well and those of the Coral Gables well were obtained from daily and project reports prepared by the engineers and from logs prepared by the Bureau (see also Vernon and Garcia - Bengochea 1967 and Garcia - Bengochea and Vernon, 1969).

Furfural is a chemical of many uses that is made by processing agricultural residues such as corn cobs, grain hulls, and sugar cane bagasse.

Treatment and disposal of waste water from this industry is of prime consideration in the location of a new plant. The waste water is stripping column effluent. It is essentially a very dilute solution of acetic acid (approximately one percent) in distilled water. It also contains minor amounts of other soluble organics and insoluble materials (waxes and 200 mg/l of minute bagasse fibers). The waste has a very low pH (approximately 2.3), high temperature (210 degrees F) and high BOD (10,000 mg/l). The acetic acid causes both low pH and high BOD.

Cost and feasibility studies were run by the engineers on lagooning to permit anaerobic stabilization before percolation to the surrounding soil, and on a deep well injection. These studies indicated deep well injection would cost slightly less and the operating costs would be considerably less (approximately $15 per day compared to $200 per day for the lagooning scheme). The overall aesthetics of well injection were found to be superior to lagooning.

Drilling, water quality, and artesian flow indicated the presence of two different ground-water bearing zones, completely separated within the penetrated part of the Floridan aquifer, see table 1, and figure 7. The upper part extended from 1045 to 1350 feet in depth. It had an artesian pressure of 18 pounds per square inch (psig) above ground level. Chlorides ranged from a low of 610 mg/l at 1320 feet in depth to 1160 mg/l between 1045 and 1105 feet in depth. The lower zone extended from 1610 to 1900 feet. It had an artesian

TABLE I

SUMMARY OF HYDROGEOLOGICAL DATA
(BLACK, CROW AND EIDNESS PROJECT REPORT)

Depth in Feet From	To	Characteristic of Formation	Estimated Artesian Flow-gpm	Chlorides as Cl mg/l
10	195	Sand, shell and marl	None	
195	662	Dense green marl (aquiclude)	None	
662	1,045	Limestone	200	1,020
1,045	1,105	Porous limestone	1,000	1,160
1,105	1,350	Very porous limestone	1,900	875
1,350	1,610	Dense limestone and dolostone		
1,610	1,850	Very porous limestone and dolostone	6,000	2,200 to
1,850	2,067	Dolostone and limestone, cavernous		7,100

pressure of 16 psig above ground level. Chlorides were 2200 mg/l. A zone of high transmissivity is present from 1900 to 2067 and flows of 6,000 gpm of 7,100 mg/l water was encountered.

A capacity test was performed, pumping surface water into the well while reading the required injection pressure. Pumping for 14 hours at the rate of 811 gallons per minute (gpm) brought the injection pressure to apparent equilibrium at 118 psig. The flow rate was reduced to 550 gpm after 25 hours of pumping and the injection pressure decreased to 79 psig.

One 6-inch monitoring well was drilled 75 feet south of the tested site. This well was drilled to 1400 feet in depth. It was cased down to 647 feet with a 6-inch mild steel pipe. The purpose of this well is to monitor the water quality of the upper Floridan artesian aquifer. This 1400-foot monitoring well is referred to as the "shallow monitoring well" because the penetrated aquifer is shallower than the injection aquifer.

During the progress of work the Bureau of Geology, Department of Natural Resources, State of Florida, recommended the deepening of the waste disposal well to the "Boulder Zone". It was estimated that the top of a cavernous zone would be found at approxmiately 2000 feet in depth. This would reduce the injection pressure and any possible clogging hazard. The well was deepened to 1939 feet and the top of the cavernous zone was entered at about 1850 feet in depth. The flowing yield from the well increased to an estimated 6,500 gpm. The chloride content increased to 7100 mg/l.

A deep monitoring well was then drilled 1000 feet southeast of the waste disposal well. This is the general downgradient direction of ground-water flow in the area.

The deep monitoring well was drilled to 2067 feet with similar construction to that of the waste disposal well. This permits the use of this well as a standby in the event of interruption for maintenance or failure of the operation of the waste disposal well.

Waste water is injected through an eight-inch stainless steel (SS304) liner. Bottom of the liner is set at 1610 feet below top-of-casing level. The annular space between liner and 12-inch casing is sealed with a combination SS-304 liner hanger and teflon seal. This seal is located at 1482 feet below top-of-casing level. The annular space above the seal is kept under pressure with inhibited water. This water is circulated continuously in closed circuit. Any appreciable change in pressure in this circuit will indicate a leak in the casing liner system. The quality of the circulated water is also kept under surveillance.

A daily record is kept by the owner of the following:

1. Volume of injected waste.
2. Average injection pressure
3. Acetate ion content in the shallow monitoring well.
4. Acetate ion content in the deep monitoring well.

Waste disposal operations were started December 17, 1966, and it is estimated that 280 million gallons of wastes have been injected to 1970. As expected, acetates have been detected in the deep monitoring well but not in the shallow one that is open to the Floridan aquifer.

Waste water from the furfural plant in Belle Glade, Florida, has been successfully injected into brackish-water for the first 3-year season. This is a well with an open hole between 1500 and 1940 feet in depth. Proper casing and cementing have kept the waste below relatively fresh water aquifers. Injection pressure ranges from 50 to 60 psig at the nominal injection of 500 gpm.

Data from two monitoring wells have indicated dilution and horizontal displacement of the waste into the high-chloride waters of the aquifer. These data also indicated the absence of any vertical upflow of waste to the upper aquifers.

Continuous monitoring and periodic complete analyses of the system is planned as necessary to protect the relatively fresher quality of the upper aquifer.

The system described offers possibilities for injection of other or similar wastes into the deep subsurface. It offers also possibilities for investigations and research which should be undertaken before this type of waste disposal becomes popularized in Florida.

TREATED MUNICIPAL SEWAGE INJECTION

In early 1968, Black, Crow and Eidsness of Gainesville were asked by the Peninsula Utilities Corporation to develop costs on methods of upgrading its treatment of wastes and of disposing of the effluent. Water from Snapper Creek canal was being used as dilutant and the system was being overloaded. Following preliminary studies, the engineers contracted the Bureau of Geology for a determination of the geology, stratigraphy and hydrology of the area and requested an opinion of the possible use of the subsurface for injection of the treated wastes.

Information developed in drilling the Coastal-State, Robinson-State, and Coastal-Williams oil wells were used as controls to project indicated high transmissivities into the Miami area. The Coastal-State lost ½ returns at 2494 and all returns between 2760 and 5530 feet. The Robinson-State lost circulation between 1210 and 3662 and cavities were recorded at 2826-28, 2833-34, and 2547-48 and permeable zones correlate well with the Coastal-Williams, that lost circulation at 2670 feet and gained salt-water flow at 3575. A cavity was recorded between 4285-4300. On the basis of electric log data it was predicted that a zone of "lost circulation" would be encountered at about 3000 feet in the Peninsula well.

On the basis of these, and correlative data, Black, Crow and Eidsness prepared and documented the preliminary specifications for an injection well. The test well was approved by the State Board of Health and it was drilled in late 1969. The well was thoroughly sampled chemically, physically, hydrologically and geologically because of a need to develop more knowledge about the base of the Floridan aquifer and other zones of high transmissivities, particularly as to diagenesis and the balance of dissolution and saturation between the liquid phases and the solid phases.

The following characteristic elements and factors relating to the information of the zone of high transmissivity were developed:(fig.8)

1.) Samples of rock cutting, taken on interval of 5 feet, with that part of the well below 900 feet being drilled by reverse-circulation for controlled sampling.

2.)Small samples of water were taken at 5 foot intervals and gallon samples at each 20 feet of penetration, by means of air lift of flow from the drill stem when it was standing at the base of the well

3.) Temperature in Farenheit

4.) Specific gravities of the water at 20 foot intervals

5.) Chlorides at 20 foot intervals

6.) Conductance of the water in the wellbore

7.) Resistivity log

8.) Self Potential log
9.) Gamma-Ray log
10.) Cement-bonding log
11.) Caliper
12.) Velocity of flow, while pumping the well by air lift
13.) Alkalinity and pH
14.) Isotopes of solid phases through fresh and salt water interfaces and at the base of the well.

The partial data resulting in the final completion are summarized in figure 8, (Plate 4-2 of Black, Crow and Eidsness Report Project No. 498-70-50, February, 1970). This plate also shows the method of the construction of the well. The Peninsula Utilities Corporation has built an improved sewage treatment plant and is planning to inject sewage, treated to 90 percent.

The injection system is equipped with the most sophisticated monitoring systems, as fully automatic as present technology permits and designed to shut the system down during a failure.

Casings set at 545 and 1810 feet overlap and are cemented to isolate and expose the Floridan aquifer and permit the monitoring of shallow (Floridan aquifer) waters. A program of monitoring existing wells drilled to the Floridan aquifer and to the Biscayne aquifer will also be undertaken.

The plant will operate a contact stabilizition process to reduce the residual BOD to less than 20 mg/l and the well is scheduled to go on stream in October, 1970. The operator of the utility has installed analytical equipment to provide continuous automatic monitoring on the flow, injection pressure, chloride residual, pH, dissolved oxygen and the specific conductance of the injected fluids. In addition a small flow of water from the annulus between the casings that isolate the Floridan aquifer will be monitored continuously for conductance. Any large change will indicate the failure of the casings or plugs. Regular reports to the engineers and to the regulatory agencies are scheduled.

The Department of Air and Water Pollution Control Commission has been given the responsibility of regulating all drainage and injection wells and the policy regarding the use of these wells, as adopted by the Department on May 11, 1970, is reproduced as follows:

1. Drainage Wells - Recharge of fresh water aquifers is desirable but every effort should be made to prevent contamination.

a. Injection to Prevent Salt Water Intrusion and Recharge of Fresh Water Aquifers: Waters for such use should supply treatment following sewage treatment of a high degree. Acceptability shall be contingent upon the checking of such wastes for bacterial and viral content prior to injection.

b. Closed System Air Conditioning Cooling Waters: This type of water is normally acceptable, provided bactericides or antifouling agents are not used so as to cause contamination. With these conditions being observed, such waters are acceptable for discharge to shallow aquifers.

c. Open System Air Conditioning Cooling Waters: To be evaluated on an individual basis. If no additives are present in harmful quantities, such waters may be disposed of to shallow aquifers.

d. Lake Level Control: Wells for lake level control should be planned and evaluated on a basin or subbasin scope to include all pertinent factors. Such wells should be part of the overall basin, or area, drainage plan and should be engineered with proper catch basin, trash screens, and adequate inlet structures (the Bureau of Geology favors siphon-intakes, as shown in figure 15). The pollution potential of the area to be drained should be evaluated as part of the overall decision-making process. For example, in areas served by septic tanks a considerable pollution load could be placed underground and wells should not be permitted in such cases. Inlet structures should include some type of filtration equipment to clarify the water prior to being allowed to drain underground.

e. Drainage of Farm Lands: Drainage wells for such purposes should be limited to those cases where necessity can be shown and the danger of contaminating underground waters is slight. When permitted, inlet structures should be required similar to those of lake level control.

f. Swimming Pool Drainage: Such drainage wells should be limited to those which are cased either to a saline aquifer or to a point where discharge cannot endanger water supply aquifers. Such wells should be preceded by suitable inlet structures.

g. Disposal of Waste Waters: Drainage wells for such uses should be severely limited and if possible other means of effluent disposal should be found. Treatment should include clarification as final polishing. In many sections of Florida, solution channels and cavities have developed in the underlying limestone formations and these permit rapid movement of water and entry into aquifers used for water supply or into streams. Where such instances are found, disposal wells should be eliminated in the proper manner.

2. Deep Disposal Wells:

Such wells normally terminate in the boulder zone or other deep aquifers. It is imperative that there be an aquiclude to prevent vertical movement upward from the disposal aquifer. The number of such wells is limited and each had been permitted after prior study and installation of a test well. Knowledge of Florida geological personnel as well as

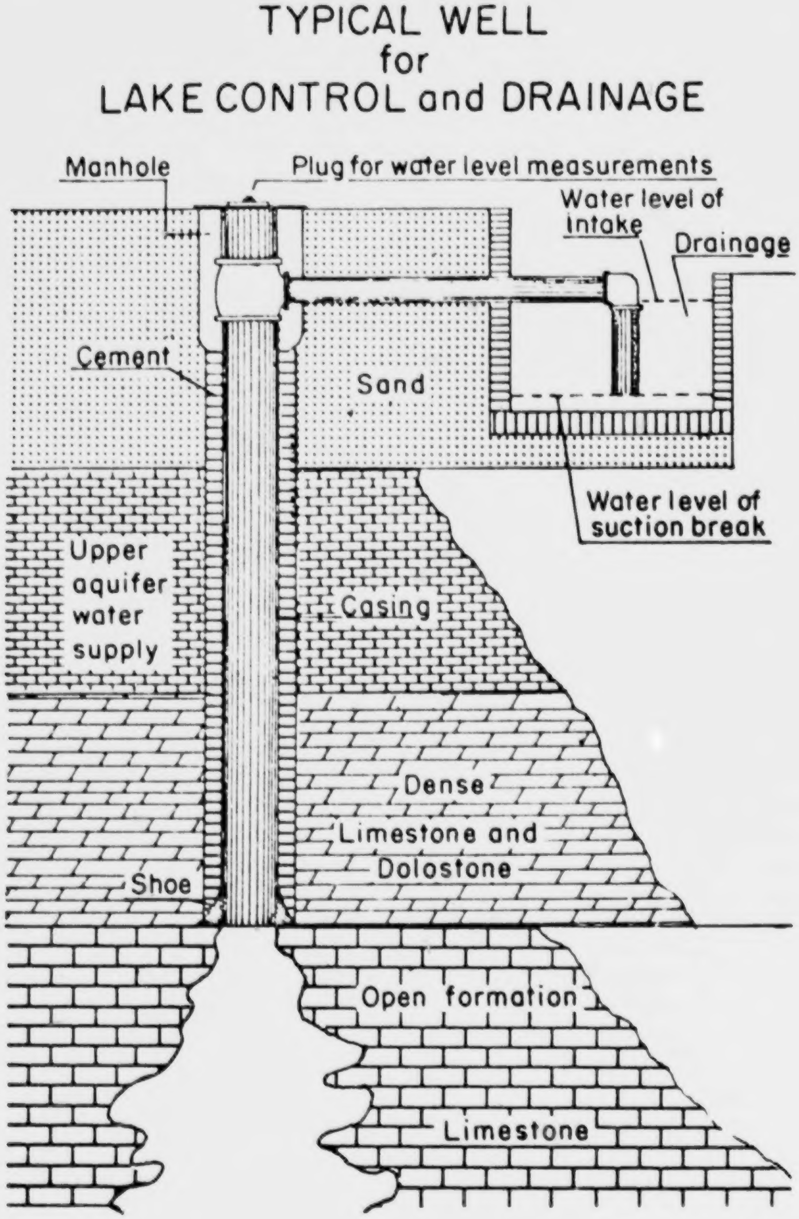

TYPICAL WELL
for
LAKE CONTROL and DRAINAGE
Manhole
Plug for water level measurements
Water level of intake
Drainage
Cement
Sand
Water level of suction break
Upper aquifer water supply
Casing
Dense
Limestone and
Dolostone
Shoe
Open formation
Limestone

Figure 15. Typical lake control well.

those of the USGS has been brought to bear on each of the wells permitted. In brief, each case has been approached on a cautious, individual basis. It is felt this type of program should be continued in this same manner, following certain principals.

a. Each installation should be considered on its own merits.
b. Maximum treatment of waste waters should be required.
c. The geology and geography of the area should be studied.
d. A test well should be installed.
e. Results of the test well drilling should be evaluated.
f. Compatability of the aquifer and the waste waters should be studied.
g. If results to this point are satisfactory, a complete installation should be engineered. This should include:

1.) Waste treatment facilities
2.) Disposal well design, including casings, seals, groutings, and other pertinent aspects. An alternate, duplicate well should be provided.
3.) Test wells to be used to monitor disposal aquifer and upper aquifer.
4.) Disposal well casings.
5.) A system of regular reporting of the functioning of the system to provide all pertinent information.

A program should be started as soon as possible to locate and eliminate drainage wells which do not conform to these guidelines.

USE OF CAVERNOUS AREAS OF THE SUBSURFACE AS A WATER RESERVOIR

There are only limited areas where water can be stored upon the flat terrain of Florida, generally requiring a rectangle of levee-fences. In south Florida, this storage is self defeating because the evaporation and seepage equal or exceed the rainfall. However, the subsurface has an enormous unused storage capacity. Highly permeable zones could be used to store bubbles of fresh water during times of surface flooding by depressing the salt water contained in the zone. Recovery could be by natural flow but storage injection will require pumping. It is anticipated that the efficiency of such an operation would increase with periodic use until complete recovery of stored water can be made.

If wastes are also to be injected into zones of high transmissivities, perhaps a detailed study would reveal the presence of several zones, stacked one above the other in the subsurface. In which case, the deepest zone with the lowest quality of water and nearest the coast could be used for injections of wastes and conversely the higher zones with better waters reserved for fresh storage.

It is interesting to note that it is possible throughout most of the southern peninsula of Florida to produce water by artesian flow, with near potable quality (1,000 - 3000 mg/l chlorides), to process this water through a desalinization plant and then inject, through gravity flow, the saline residues back into zones of high transmissivities lower in the Floridan aquifer, where the water has a lower specific gravity than the residue. Where the specific gravity of the brine is higher than the water of the subsurface, storage tanks could be drained by syphoning.

In Israel (Weiner and Walman, 1962) the underground storage of water is possible and necessary. An unlimited supply could also be made available in south Florida by constructing a series of large injection wells into which the large part of any excess water could be pumped during wet seasons and released during the dry.

Because of the submergence of highly valued land the flat topography in Florida, the storage of water underground provides many advantages over that of surface storage. These include: 1.) decreased evaporation losses; 2.) better use of land areas; 3.) little construction and maintenance costs; 4) no recovery (pumping) costs in artesian flow areas; 5.) no siltation of reservoirs; 6.) stable water quality and temperature; and 7.) no flooding.

The disadvantages include the loss of recreation, transporation and esthetic potentials.

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APPENDIX I

CHEMICAL ANALYSES OF FORMATION WATERS ENCOUNTERED IN THE PENINSULA UTILITIES INJECTION WELL

SNAPPER CREEK CANAL PLANT, CORAL GABLES, FLORIDA
U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
ANALYSES BY GEOLOGICAL SURVEY, UNITED STATES DEPARTMENT OF THE INTERIOR
(MILLIGRAMS PER LITER)

9-268 q

Depth	1,705'	1,765'	1,810	1,850	1,950'	2,947
Date of collection	9-9-69	9-9-69	9-9-69	9-9-69	9-10-69	12-17-69
Silica (SiO_2)	11	10	10	8.5	6.1	4.8
Iron (Fe)						.36
Zinc (Zn)						.04
Manganese (Mn)						.02
Copper (Cu)						.10
Calcium (Ca)	171	203	276	405	500	428
Magnesium (Mg)	218	262	415	755	1200	1300
Sodium (Na)	1600	1940	3490	6880	9860	10800
Potassium (K)	59	71	127	252	380	415
Strontium (Sr)						9.4
Bicarbonate (HCO_3)	172	168	170	162	164	142
Carbonate (CO_3)						
Sulfate (SO_4)	568	592	800	1440	2280	2660
Chloride (Cl)	2950	3650	6500	12500	18100	19300
Fluoride (F)	1.1	1.1	1.2	1.3	1.4	1.4
Nitrate (NO_3)	0.0	.1	.1	.1	.2	.8
Bromide (Br)	8				64	64
Iodide (I)	.00				.00	.00
Dissolved solids Calculated	5690	6830	11700	22500	32500	35000
Residue on evaporation at 180°C						
Hardness as $CaCO_3$	1350	1610	2440	4170	6240	6430
Noncarbonate hardness as $CaCO_3$	1210	1470	2300	4040	6110	6310
Alkalinity as $CaCO_3$	141	138	139	133	135	116
Lithium (Li)						.17
Specific conductance (micromhos at 25°C)	9700	11,600	19400	34500	47200	50000
pH	8.0	7.9	7.9	7.8	7.8	7.6
Color	5	5	5	5	5	5
Temp.	22.0	22.2	22.2	21.7	21.0	16.0
Chromium (Cr)						.00

MR. STEIN: Go ahead.

MR. VERNON: Upon this platform there have been deposited a number of layers of sediments, largely carbonates, limestones and dolostones, and these limestones and dolostones have large capabilities of moving fluids horizontally and a limited capability of transferring these fluids vertically.

Water has been insinuated into and upon these sediments, both saline and freshwater, so that we find in Miami that we have about 1,000 feet of sediments that we would like to consider for this report, the base of which are composed of several acquifers containing salt water, many of which have large capabilities of moving water horizontally to the ocean and can be used for multiple purposes of water storage and perhaps for disposal of well-treated sewage materials.

Above these acquifers is a portion of what we call our artesian acquifer, the Floridan artesian acquifer, and it is the source of most of the water supply for the cities of Florida, the southeast peninsula coast being an exception. Large quantities of water are produced from this acquifer, but in this area the water that is contained in it is too highly mineralized to use. It contains 1,000 to as much as 3,000 parts per million chlorides and up to 10,000 parts per million total dissolved solids.

Between this artesian acquifer and what you use here, the acquifer which you use here, the Biscayne acquifer, there is about 400 feet of very fine grain sediments, clays, marls, that prevent the mingling of these artesian waters under pressure and the leakage of these artesian waters under pressure with those that are present here at the surface.

The Biscayne acquifer is composed primarily of sandstone and limestone that has a very large capability of moving water, both vertically and horizontally. And frankly, what you are dealing with here is practically an open reservoir. The water is closely connected. We fondly think that whenever we produce from wells and put that water in our system that we are producing groundwater. Actually what we are doing is causing a drawdown on the nearby canal which contains sewage and are drawing into the water supply sewage that must be eliminated if it is to be used insofar as the public water supply is concerned.

Mr. Stein and Mr. Thoman, I think you have been introduced to only a part of Florida's dilemma today, that is the part here in Dade County, but this beautiful State, which is graced with tidal waters of several thousand miles, attracts people like a flower in bloom attracts insects, and I use that advisedly. Our population is anticipated to double each 10 years. People cause pollution. And so far as I am concerned, I think what we are dealing with is a problem that must be faced up to, that we simply do not have the water to continue to waste to the ocean and that we must approach this problem from a resource base instead of from look at the other end of how to get rid of it.

Our economy is a three-legged monster based one leg on tourism, one on agriculture, the other on resources. I am in the resource field. I am promoting resources. All of them pollute in some measure.

It is obvious that tourists do. Whenever you have people, they ingest, digest and must eliminate. So far as I know, there is no way to get rid of this elimination outside of seeking it, bringing it to one place where it can be treated, and then you are faced with the problem of what to do with the final effluent. You must go to full treatment and replace it back into the environment, you must waste it out to the ocean.

Or I offer you a third alternative in this book that I handed you today, that is to place it,in some cases where the quantities permit,into the ground, and we feel reasonably safe after our study of this year, and we are getting grants now from the USGS and will be working with USGS in monitoring this system further, that we can do this successfully and that it does offer a reasonable solution for many cases along the coast that does not now exist.

Agriculture and tourism pollute, tourism by human wastes and solid wastes, agriculture by pesticides, insecticides and nutrients. Both compete for land. Resources, on the other hand, compete for land. There is some pollution in sedimentation and some of our pits, there is a slight waste of land where we are not successful at the time, at the moment, to get restoration of the land.

But I say to you that resources offer a chance to widen this ecomony, the base of it, and that we ought to give some thoughtful consideration perhaps to a moratorium on resident and tourist growth to permit us to do three things.

First off, I don't think that our resource agencies, that our regulatory agencies, have developed the kind of sound data program upon which they can base solid and uncontested opinions from which the engineers, the sanitarians, the geologists can then go and build a program to develop a supply and disposal system that will work to the full satisfaction of all of us that are in this field of resource monitoring.

Frankly, I think what is facing you as the regulatory agency of air and water pollution and us as natural resources monitoring is simply thatwe are being drowned with people. And

I think these people are becoming concerned about our environment. I said concerned, yes. Informed, perhaps no.

The reason I say this is because as I came to the airport yesterday morning I passed a car and it had a faculty sticker on it. It was belching forth a big cloud of smoke. It had a bumper sticker on the back that said, "Clean up air pollution, buy a horse." (Laughter.) And I couldn't see this quite, because have you ever thought how much real pollution a horse gives up and how many horses it would require to replace the internal combustion engine? I think it is pretty obvious that we would be drowned in something else. (Laughter.)

This area has been drinking for years treated sewage, well-treated sewage fortunately, and for all practical purposes insofar as the resource side is concerned I think I would have to say that if you want to continue to have water you are going to continue to drink sewage. For all purposes we have got to have all the water that can be produced in this area at the present time. This is the one area in all of Florida where the evaporation exceeds that of the rainfall, and during periods of low rainfall you simply are bankrupt insofar as water. If you take several hundred million gallons of water and waste it out to the ocean, then you are several hundred million gallons of water short--short of water for your lawns, short of using it for industry and the satellites must support this tourist that is going to flood you.

The best conservation, I think of water is to use it. I don't know of any way that you can pile it up on land between fences and have it stand there. It will evaporate. Water has a cycle of falling as rain and of moving out to the ocean. The only conservation that you can propose for it is to use it before it gets out to the ocean, to capture it before it gets there and to recycle it, to reclaim it if necessary, and I propose that in these large holes that are developed beneath the cities of the coastal area, we are talking about 60- and 90-foot cavities that we feel are connected to the ocean, that if you place freshwater, treated sewage, both, in these tremendous cavities that there will be a slow migration towards the ocean of 7 or so **meters** per year, that if this is brought inland a few miles that this water could be recovered ultimately by wells under its own flow, put there by the pressure of overcoming the artesian pressure that is normally there, and then you would have a resource that I feel we would be able to live with, could be monitored, could be free, and we would go back to a pristine pure Florida pressure. (Applause.)

MR. STEIN: Thank you, Mr. Vernon.

Any comments or questions?

MR. REED: Mr. Stein, of course the point is very, very well taken that in our real desire to get rid of our wastes the ocean outfall was a prompt way, cheap way, but a very wasteful way.

And we are all coming to the same conclusion, there is no question about it, Mr. Vernon, that water is so valuable that we are all beginning to question with you--and I am so glad you made this presentation today--how long we can afford to send this many millions of gallons of water to the sea each day. It is a very thought-provoking subject.

MR. STEIN: If we have that and if we are really one system, Mr. Vernon, I agree with Mr. Reed, your remarks are very well taken. But if we are going to put this water back and drink in what we discharge, don't you think there is a prerequisite that we give it the best possible treatment before we discharge it?

MR. VERNON: Oh, absolutely. I would anticipate that Florida is in a very unique situation, this is not unknown, in that our problem is primarily that of municipal sewage and that if this were brought up to treatments of 90 percent or thereabouts we would end up virtually with the nutrients left, and I feel that the phosphates, for instance, would drop out with interaction with the carbonates, and the nitrates I simply don't know, I don't know if anybody knows what would happen to those. But nature has a way of cleaning up a great deal of these things and I have a feeling that in a few years in that acquifer that even these would be unidentifiable.

In the first place, the volumes of water that are present there, cubic miles of water that are available for dilution again, would probably make this so that it would be hard to identify anyhow, even for me.

MR. STEIN: I understand that. But you know when we put water in an underground acquifer, it can remain for ages. I know there is a place, oh, I guess this is in southern Indiana where you get the drinking water from the underground acquifer and you can get the familiar hydrogen or sulfide smell or taste of rotting organic material. This went down millions of years ago, millions, geological ages ago, and it still persists.

I do think, though, and I ask the people of Florida to look at this, that if we are going to do this--and I couldn't agree with you more that we have to consider replenishing the underground acquifers--and if we are going to take the chance of putting waste effluent in an underground acquifer and use that for drinking water again at some time, as bad as pollution is, surface pollution is, we are taking a tremendous chance with this. We have to be abundantly sure that we provide the best possible treatment and take out all possible impurities before we do this.

MR. VERNON: Mr. Stein, I would go even further than that. We have got to be abundantly sure that we know our geology, that we know our hydrology, and we feel that we are abundantly sure.

MR. STEIN: Yes, I recognize that with your geology.

You know, I also want to compliment you on your delicacy in dealing with the subject when you talked about that three-legged monster. For a minute I thought you were going to say we had a three-legged stool. (Laughter.)

Mr. Reed?

MR. REED: Thank you very much, Bob.

Mr. Stein, the next speaker is Mr. Thomas McGlinn, immediate past president of the South Florida Inter-Professional Council, Inc., of Miami, whose group has taken a great interest in the pollution problems of their home county.

(The following was submitted for the record by Mr. Vernon after the close of the conference:)

288-A

State of Florida

DEPARTMENT OF NATURAL RESOURCES

RANDOLPH HODGES
Executive Director

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Please Reply to: BUREAU OF GEOLOGY
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Treasurer
FLOYD T. CHRISTIAN
Commissioner of Education
DOYLE CONNER
Commissioner of Agriculture

October 27, 1970

Mrs. Virginia Hough Rankin
Certified Shorthand Reporter
6005 E. 93rd Street
Kansas City, Missouri 64138

Dear Mrs. Rankin:

You will recall that I made a statement at the Dade County hearing relative to injection wells in the process of which I made a statement that, "We are faced with three requirements: (1) we must gain time for the resources and regulatory agencies to develop a sound and data based plan that would permit them to make immediate decisions on the release of treated effluent; (2) the engineer, sanitarian, geologist, and other professionals could then develop adequately designed supply and disposal works that would be based on a firm political decision and sound professional reasoning; and (3) the people of the area can be convinced that the resultant cost is justified and must be borne by them and them alone."

In the presentation I admitted the third point and I would appreciate your courtesy if this could be added to the testimony.

Sincerely yours,

R. O. Vernon, Chief
Bureau of Geology

ROV:ebl

THOMAS B. MC GLINN, IMMEDIATE PAST PRESIDENT
SOUTH FLORIDA INTER-PROFESSIONAL COUNCIL, INC.
MIAMI, FLORIDA

MR. MC GLINN: Thank you, Mr. Reed.

In the interest of time I will read this communication to this conference.

This Council is composed of the officers of the ten professional group listed on this letterhead. For the benefit of the audience I will name them.

The Dade County Medical Association.

The Dade County Bar Association.

East Coast District Dental Society.

Florida South Chapter, American Institute of Architects.

Dade County Chapter, Florida Institute of CPA's.

South Florida Chapter, American Institute of Real Estate Appraisers.

Miami Chapter, American Society of Chartered Life Underwriters.

South Florida Veterinary Society.

Miami Chapter, Florida Engineering Society.

Dade County Optometric Association.

The combined memberships of these groups is something over 5,000. Each group individually is on record as being vitally concerned with the alarming proportions to which water pollution continues to grow unabated every single day in this Dade County area.

The news media has done a splendid job in acquainting the public with the situation that we are facing. I have attached hereto a list of a number of headlines carried in the papers.

I have got these headlines here and I will read some of them. These are the headlines in newspapers and the dates in which they appeared. Starting with October 8, 1969, over a year ago:

BAY COULD END UP LIFELESS CESSPOOL
MUST YOU GO TO COURT TO KEEP THE WATER CLEAN?
POLLUTION"SCARE TALK"IS HARD, GRIM FACT
LAW TAKES THE DAY OFF ON POLLUTION CONTROL
RAW SEWAGE FOULED THE BAY, EXPERTS SAY
MIAMI RIVER A SEWER, BAY A CESSPOOL
POLLUTION DEMANDS ACTION BY METRO
SEWAGE IS THERE BUT THE PROTEST ISN'T
CAN STRONG ACTION STOP NO-BATHING SIGNS?
FISH DYING IN SNAPPER CREEK CANAL

KNEE-DEEP IN SEWAGE, NO END IN SIGHT

CLEAN GABLES CANAL,SEWAGE UTILITY TOLD

UTILITY READYING SEWAGE WELL AT SNAPPER CREEK

DADE'S TOUGH POLLUTION LAW IS ABUSED

IT JUST KEEPS ROLLING (DIRTILY) ALONG

MIAMI AMONG 49 WHO FOULED RIVER

MUNICIPALITIES WORST POLLUTERS AROUND

BONDS POINT WAY TO SEWER SYSTEM. May 26, 1970.

DON'T COME ON IN, THE WATER'S NOT SO FINE

CATASTROPHIC POLLUTION FACING FLORIDA.

These are by no means all of them and it is, of course, assumed that these would give some concern to our local governing fathers.

The question immediately arises--What has been done to tackle this problem?

A prominent authority has informed me that all game and commercial fish are fast disappearing in Biscayne Bay because of pollution. He predicts that in five to eight years the bay will be completely devoid of this type of fish unless something is done right away to stop it.

In addition to fishing, we have the spectacle of all the hundreds of miles of canals in Dade County being positively unsafe for swimming. Of course, it should be unnecessary to add that this includes the Coral Gables Waterway and the Miami River, both of which are open cesspools.

It would be assumed that our county and municipal governments would be working feverishly to combat these grave threats to the lifeblood of our economy here, tourism. How will we be able to attract tourists if the area is devoid of clean water and fish?

The evidence of any positive approach to this problem by any of our local governments has been completely lacking. With all the local news media continually bringing the problem before our citizens, there has been no leadership whatever. A good example of this can be demonstrated in the position of the Miami Pollution Control Officer. Mr. Paul Leach resigned his position over 19 months ago. He served ever since as a consultant to the County Manager on a day-to-day basis. In essence we have, therefore, not had a Pollution Control Officer in an official capacity for 19 months. As a consequence, it has been remarkable that Mr. Leach has been able to function at all. As a temporary employee on a day-to-day basis he had little standing with the County Commission and his efforts proved to be in most instances mere idle gestures, inasmuch as they received little support from anyone in authority.

It is simply inexcusable that the County Commission did not rectify this deplorable situation which is so vital to the overall economic picture. This area simply must have a strong, knowledgeable, forceful pollution control officer to provide the leadership which we have simply never had on any level of government.

Under current legal procedures, prosecution of violations of local pollution ordinances must be instituted by the pollution control officer. Without an effective officer, prosecution is a joke. There are admittedly 250 or more known violations occurring in the county right now. Mr. Leach has only been able to bring some 15 into court.

Furthermore, our council's investigation and study to date has pointed to distinct violations of ordinances by the city of Miami through its 16th Avenue sewage treatment plant and the County Airport Authority through the discharge of chemicals, solvents and residues from airplane overhaul bases into the Seaboard Canal and then into the Miami River.

It is indeed most interesting to point out that only last Tuesday, October 13, the Metro Commission resurrected a bond issue for $40 million and approved it. $25 million has been earmarked for purchase of a large sewage system. It is admitted that there will be long delays before this is accomplished, but at long last it is an encouraging start which should have taken place some years ago. Final approval of this bond issue is hopefully taking place today at the County Commission meeting. Is it merely coincidental that this final approval is given on the same day as this enforcement conference begins?

The Inter-Professional Council is most hopeful that this Federal-State enforcement conference and its subsequent recommended pollution abatement program will be the stimulus to alert the politicians to the necessity of taking action to correct the obviously serious pollution we are experiencing. It is felt that your 6-month-long investigation will unearth some truly shocking conditions. We need the irrefutable facts and the scientific data which we are confident that you will supply.

We trust that this conference will be the catalyst which will project this area's government bodies into firm, positive action toward putting an end to pollution. It is far too important to us all to procrastinate any longer and take only trivial token steps toward solving this problem. Such steps in no way can replace the total apathy exhibited over the past several years by all our county and municipal bodies.

We are fast reaching a point of no return. Let's get on with it. Yours truly.

MR. STEIN: Thank you, Mr. McGlinn.

Are there any comments or questions?

If not, thank you very much.

MR. REED: Thank you.

Mr. C. L. Reynolds, Vice President, General Waterworks Corporation.

MR. REYNOLDS: My name is C. L. Reynolds, Vice President, General Waterworks Corporation, and Manager of the Southern Division.

Gentlemen, we wish to express our appreciation for this opportunity to address this conference. We believe we can make a meaningful contribution to the efforts here in evaluating the local situation with respect to pollution enforcement and abatement.

General Waterworks takes pride in being a responsible corporate member of the community. It is hoped that our viewpoint will be of value in considering this over-all problem.

We propose to address our statement to the experience that we have had with our various sewerage facilities, existing and proposed. We believe our objectives are in concert with those of the community. Our goal is to provide sewage service to our customers with the full understanding of the need to protect the environment in which we all live.

These statements will show the successful efforts of one corporation in overcoming the problems of keeping pace with community development while at the same time effectively controlling and reducing pollution. This will also show how a responsible corporation, acting entirely with private funds, can accomplish desired results.

MR. REED: Mr. Reynolds, may I break in? Is it your intention to read all of this?

MR. REYNOLDS: I had proposed to, sir, unless you would have some other thoughts on the matter.

MR. REED: I was unprepared, Mr. Stein, for a presentation of this length.

MR. STEIN: Would it be possible to summarize this, Mr. Reynolds?

MR. REYNOLDS: Well, sir, I will only say that the report that went in this morning and other statements have been in considerable detail and it would be my thinking that to present to this conference the full thinking of our corporation and the way we view the seriousness and the magnitude of these problems that the entire text might be in order.

MR. STEIN: You anticipate that this might take over an hour, don't you?

MR. REYNOLDS: I think that would be close to an hour, yes, sir.

MR. STEIN: Well, Mr. Reed can manage his own time.

What do you think, Mr. Reed? You have other people waiting. You can decide whether to take this now or later.

MR. REED: I have a long list, Mr. Stein. Frankly, it never crossed my mind that anybody else would have a presentation of this length.

MR. REYNOLDS: We have been working for quite a few years on this problem, Mr. Reed, and it takes a while to summarize it.

MR. STEIN: Here, let me give you the problem. I think Mr. Reed has a lot of people who are waiting to give presentations. We are prepared to hear all this.

The State manages its own time. Mr. Reed, you will have to decide whether you want to call your own people first.

MR. REED: In all fairness to everybody who has come today and wishes to speak, I think with Mr. Reynolds' permission I would like to reschedule this at a set hour tomorrow morning to be read in its entirety, which is the prerogative of anybody who comes before this conference, and I would like to set the time as a quarter to 11 tomorrow morning, to be the last item before the luncheon break.

MR. STEIN: That would be fine.

Is that agreeable to you, Mr. Reynolds?

MR. REYNOLDS: Certainly.

MR. STEIN: Thank you.

MR. REED: Thank you, Mr. Reynolds. That will be very helpful.

The next on the list is Paul William Leach, President, Environmental Consultants, Inc.

MR. DENNIS CARTER: Mr. Reed, Mr. Leach had to leave. He said he hoped he would be back tomorrow morning.

MR. REED: We will recognize him tomorrow morning.

Dr. William Fogarty, Associate Professor Civil Engineering, University of Miami, Coral Gables.

DR. WILLIAM FOGARTY
ASSOCIATE PROFESSOR CIVIL ENGINEERING
UNIVERSITY OF MIAMI, CORAL GABLES, FLORIDA

DR. FOGARTY: Gentlemen, I will not read this in its entirety.

I would like to call attention to an exhibit which we did bring with us and which you may choose not to enter into evidence. About three minutes ago a little bell went off here in the front of the room. This is the effluent from three sewage treatment plants that we chose to illustrate to you today, and if you would like to enter this into evidence, I will try to pour it into the tape recorder. (Laughter.)

MR. STEIN: We have a bell on the tape recorder that objects to that. (Laughter.)

MR. FOGARTY: A brief summary.

Dade County waters are generally in an advanced state of degradation. Two years of bacteriological data, that have been given to you earlier in the Federal report and also in this report as one of the appendices, show most of the major canals do not meet the water quality standards set for swimming, as set forth by the American Public Health Association. The median most probable number (MPN) coliform bacteria per 100 milliliters exceeded the 1,000 limit in most of the canals sampled between December of 1967 and December of 1969. Appendix C in the report will illustrate this to you. MPN values were recorded at various locations along the canals and typical findings have already been stated, so we can skim over that.

Dissolved oxygen or DO levels of selected canals in Dade County over the same 2-year period were found to be extremely low. These data are given in Appendix D. It should be noted that the minimum values of DO are the controlling data, not the mean, not the average, not the median, not the most, but the minimums. I think the reason for this is that fishlife has to be in constant presence of dissolved oxygen to survive. It would seem ludicrous to me to think of a concept where we stated that the average oxygen value that we had in this particular room was about 20 percent, even though for a period of about 2 hours it was zero.

None of these minimum data that were taken that are illustrated in this report were taken the period about one to two hours preceding the rise of the sun, which would be the point in which the minimum dissolved oxygen levels would occur.

Fish kills have been noted in many areas lately in the Coral Gables Canal near the Red Road Dam on September 17 at 11 o'clock a.m. Most of the fish were badly decomposed, probably dead for 24 hours or less. The species found were largemouth bass, catfish, bluegill and eel. And believe me, when you kill an eel due to lack of oxygen, you are really doing something.

The DO at the time of discovery was very low at 0.4 parts per million at the dam. This was 11 o'clock in the morning. On September 13 last year we had a fish kill of several thousand catfish. They were the only species in the waterway at the time.

Five major canals surveyed contained significant amounts of benthal material that are attributable to sewage treatment plants. And I would like to refer at this point to one of the appendices, Appendix B.

In the sludge bank studies that have been performed, in Gratigny Canal, in the area of Hialeah, we know that there are approximately one-quarter of a million gallons of sludge that are located there and a few typical cross sections are given for you in Appendix B.

In the Myrtle Grove effluent canal at this time there are approximately 3.2 million gallons of sludge that are waiting there for someone. They have come from the Myrtle Grove sewage treatment plant, the contribution of that particular plant to the public.

In the area of the Community Utilities Effluent Canal and the Coral Gables Canal, there are nearly one million gallons of sludge that are there. They have been there for quite sometime. Notification was given a year ago to the officials of General Waterworks regarding this million gallons and it is my understanding that at long last they are starting to look at the possibility of taking some of this material out.

In the Oleta River a half million gallons of sludge were in there until a short period of time and it is my understanding that within the past couple of weeks an effort has been made to take this out.

The same is true of the Carol City Canal, where approximately three-quarters of a million gallons of sludge have been recently removed.

The effect that local canals and sewage treatment plant outfalls have on Biscayne Bay has been demonstrated by several random sampling programs carried on early in the year by University of Miami graduate students in cooperation with the Hoover fund. And I must make a point at this time.

Each time that we have gone out with very limited funds and taken grab samples, we have received criticism when the grab samples indicated that the counts of fecal contamination were high, and I am wondering when we get to a point where we have--well, let's see, right now we are sitting on several hundred grab samples we have taken and about 20 percent of them indicate fecal contamination in the waterways we have looked at. My question is, how many grab samples do you have to take until you have surveyed the entire population and you can say this particular set of waterways are polluted?

MR. STEIN: I can let you in on a secret on that, Mr. Fogarty. When you are dealing with a discharger or a polluter, they are never enough.

DR. FOGARTY: I agree, unless you--we are working on a large vat at the university now in which we can take the entire bay and run an analysis on it. (Laughter.)

MR. STEIN: By the way, I do think you are going to have to reconcile yourself, if you are going to meet this, either to face this head on or take 24-hour composites. I have never found a limit that is going to satisfy anyone who is a discharger.

DR. FOGARTY: The effect of dumping millions of gallons of raw or partially treated sewage off the coast can be seen by many sewage-related articles which from time to time wash up along Miami Beach and the very high offshore bacterial counts that we have taken. Several preliminary studies have indicated that these wastes are not accepted by the Gulf Stream, as was hoped, but are entrained in the narrow band of coastal waters.

I think that one of our students, Jackivicz, has made his point regarding septic tanks and I need not go into that. A copy has been already sent to you.

With respect to sewage treatment plants, and I think this is one of the areas where you will be able to find the prime offenders as far as our inland waterways are concerned which then pollute the bay and other areas.

The problems faced by Dade County treatment plants are basically twofold. Many of the plants are overloaded and many of the plants are improperly equipped and maintained. Bearing in mind that Dade's population is generally at its lowest ebb during the summer months, a July 1970 report showing the monthly average flow rates for 1969 of the larger plants in the county revealed that 19 percent were operating over 100 percent of their design capacity. A listing of these is given to you here.

The indications are that the plants should be carefully investigated to ascertain the effects brought about by their reported conditions of hydraulic overload. In addition, the majority of small plants cannot or will not report their flows, so it must be assumed the percentage of overloaded plants is greater than indicated.

At the beginning of this year, in September of this year, a course in the field of environmental pollution control was offered to graduate students at the University of Miami. One of the projects assigned set the criteria of developing a field testing team approach for performing sampling at the sewage treatment facilities with the following constraints:

(A) Sampling should involve physical, chemical, and bacteriological testing; (B) Grab samples were to be taken in the initial program to pinpoint appropriate violations of present codes; and (C) Prime consideration should be given to representative sampling, accuracy, precision and speed.

A team of four graduate students that brought together this particular report were formed and after a series of plant visits were scheduled, analyses were run. Random sampling times were chosen for testing the effluents of approximately one-third of the sewage treatment plants in Dade County. And I would like to list to you the program findings with regard to violations that occurred. These samples were taken on three occasions in the field, three random days selected, and the team of four students went out and they found the following violations:

At the Community Utilities South Plant the chlorine residual at the time of visit was 0.2 parts per million whereas 0.5 is required by law. At the same time the total coliform count was 400,000 and the fecal coliform count was 35,000. They were operating at that time at 170 percent of their design capacity.

Florida Processing refused us entrance to the plant to take samples and the odors around that particular plant illustrated why they refused us entrance.

Dr. W. Fogarty

Westwood Lakes again refused us entrance, although going to the outfall line where their contribution to the creek was made gross discoloration indicated the quality of treatment that they had.

The Seaboard Sewage Treatment Plant effluent had a turbidity of 200, total coliforms in excess of 200,000 with settleable solids at 1.5 milliliters per liter. Fecal coliforms were in excess of 10,000 and this is the number of organisms in a 3-ounce sample, one good gulp out of a half quarter can of beer.

Golden Isles had a total coliform count of 4,000 and fecal coliform count of 180. Their flow at the time we visited was 150 percent of the design flow.

Going to Miami Lakes, we found a turbidity of 280 Jackson candle units,settleable solids of 40 milliliters per liter, total coliforms in a 3-ounce sample in excess of one million and fecal coliforms of 500,000. The chlorine residual was 0.2, well below that required by the State and by the county.

Going out to Virginia Key, we picked off 6,500 total coliforms and 750 fecal coliforms in a sample of 100 milliliters, indicating possible need for additional chlorination.

Over to Carol City, we got settleable solids of 2 milliliters per liter, again in violation of our current law.

We went to the Shores Apartment and the BOD effluent from that plant was in excess of 150 parts per million. The settleable solids were in excess of 40 milliliters per liter. This is gross pollution. Total coliforms of 100,000 and fecal coliforms of 40,000.

On to Westchester Hospital, and if you want to talk about effluents from sick people, settleable solids of 4 milliliters per liter, turbidity of 115 parts per million, a chlorine residual of 0.3, well below that required by the law, total coliforms of 20,000 and fecal coliforms of 200.

We then went on to Palm Springs Condominium. The sample that we took is the one on the left up here. The settleable solids, as you see, are in excess of 500 milliliters of settleable solids per liter of sewage. Turbidity in excess of 1,000 Jackson candle units; we couldn't measure it. The chlorine residual was zero; there is no chlorine residual in it. The total coliforms in excess of 3 million organisms in a 3-ounce sample and fecal coliforms in excess of 300,000.

Went over to K-Mart--

MR. THOMAN: That looks a little septic over there.

DR. FOGARTY: Pardon?

MR. THOMAN: I said that looks a little septic over there.

DR. FOGARTY: I will bring it over to you in just a minute. (Laughter.)

MR. PATTON: I think he can smell it where he is.

DR. FOGARTY: We moved on to K-Mart and the turbidity there was 100 Jackson candle units and they had a broken flow meter.

To Hialeah Convalescent Home, another place that we would be very, very wary of effluents, we found that the chlorine residual was zero. The total coliforms were in excess of a million in a 3-ounce sample and the fecal coliforms in excess of 200,000 in that same sample. The chlorine tank was empty.

To Palm Springs to the north--Palm Springs North to their outfall, we pulled a sample and got settleable solids of 11 milliliters per liter, turbidity of 80, total coliforms of 50,000 and fecal coliforms in excess of 20,000.

Over to Lake Cecil to the outfall, settleable solids of 10 milliliters per liter, a definite violation, turbidity of 115 Jackson candle units.

To Lakeview Garden Apartments, the chlorine residual was zero, the total coliforms a half million, the fecal coliforms 1,000.

To the Airport Crossway Inn, where there is a foot between the chlorine contact chamber and the line that is supposed to deliver chlorine, a foot of air, (laughter) the chlorine residual is zero, the total coliforms in excess of 5 million and fecal coliforms in excess of 3 million.

To the Holiday Inn in Miami Springs, settleable solids greater than 200 milliliters per liter. The Holiday Inn is sitting on the right-hand sample here. A turbidity of 375 and a chlorine residual of 0.1, well below the 0.5 required.

Then on to Howard Johnson's, not to outdo the Holiday Inn, where the chlorine residual was zero, the total coliforms in excess of 3 million, and fecal coliforms in excess of 300,000.

We went to the Sheraton Beach and we didn't even bother anything there because the trickling filter, which is probably the most miserable form of secondary treatment you can have, had the effluent coursing down through the center of the pipe while the arms were going around driven by a motor, not putting any of the effluent onto the bed.

MR. STEIN: Did you check the valve on that arm? Maybe it was leaking some mercury. (Laughter.)

DR. FOGARTY: Mercury, yes.

Dr. W. Fogarty

Gentlemen, I think the points that we brought out here are points that indicate that in a period of just a few hours, with a few graduate students who have the capability of running analysis, of getting it, getting in and getting out, we could have brought very probably 50 cases before the courts based on violations here, of which I would say 40 of them should and would, with proper examination, result in convictions, fines and jail sentences.

The complete set of data that we got are given in Appendix A.

And so the last statement to bring here is that the past enforcement activities of the Dade County Pollution Control Department have been difficult to evaluate due to obvious false claims. The previous Pollution Control Officer in mid-1969 addressed the Inter-Professional Council regarding water pollution control efforts in Dade County and stated at that time that his office had over 70 wins, and I quote that, over 70 wins in the courts. On a radio interview on WVCG at a later date, about six to eight months later, the same Pollution Control Officer when asked about his water pollution court record--well, I will tell you what he stated. Just one minute.

"We've just recently won another and that brings our record up to thirty straight." **(The doctor played quote from tape.)**

(Laughter.)

DR. FOGARTY: So now we have gone from 70 straight wins or 70 wins to 30 straight, that was six months later, and several months later in reply to a blistering Grand Jury report the same Pollution Control Officer listed 14 convictions against water pollution defendants and a total of $2,700 in fines. My God, if we go any longer, we won't have any! (Laughter.)

These contradictory facts are on the record, and if we assume the most recent report of 14 wins as true, we find an indication of the great need we have in Dade County for assistance from any and all interested agencies on the local, State and Federal levels. It is in this respect that we seek your assistance.

Thank you. (Applause.)

(Which said report and appendices follows:)

POLLUTION IN DADE COUNTY: A STATUS REPORT

OCTOBER 1970

THE UNIVERSITY OF MIAMI

POLLUTION IN DADE COUNTY:
A STATUS REPORT

OCTOBER 1970

Respectfully Submitted By:

Guy V Johnson
Guy V. Johnson

James Kay
James Kay

Colin A. Morrissey
Colin Morrissey

Kenneth W. Schang
Kenneth W. Schang

CANAL, BAY AND OFFSHORE CONDITIONS

Dade County waters are generally in an advanced state of degradation.

1. Two years of bacteriological data show most of the major canals do not meet water quality standards for swimming, as set forth by the American Public Health Association (Joint Committee). Median Most Probable Number (MPN) coliform bacteria per 100 ml exceeded the 1000 limit in most of the canals sampled (December 1967 to December 1969). (See Appendix C) MPN values were recorded at designated locations along the canals. Typical findings are as follows:

   A. Tamiami-Comfort-Miami Waterways and Snake Creek-Royal Glades Canal both showed median MPN values over 1000 in 10 to 14 locations.

   B. Snapper Creek, Oleta River, Coral Gables Canal and Waterway, and Little River all had maximum MPN values over 2400 at all sample locations.

2. Dissolved Oxygen (DO) levels of the selected canals in Dade County over the same two-year period were found to be extremely low. (See Appendix D) It should be noted that the minimum values of D.O. (dissolved oxygen) are the controlling data since the fishlife must be in the constant presence of D.O. to survive. In addition, none of these "minimum" data were taken just prior to sunrise, the worst D.O. condition in our waterways. Median levels of D.O. for the Coral Gables Waterway and Snapper Creek were in the 2-3 ppm range. Game fish are severely restricted when the D.O. drops below 5 ppm. In a report on fish kills in Dade County (1),* a few recent kills were described.

> "A fish kill was noted in the Coral Gables Canal near the Red Road dam on September 17, 1970, at 11:00 A.M. Most fish seen were badly decomposed, probably dead for 24 hours or less.
>
> Species found were: Largemouth bass (up to 6 lbs.), catfish, bluegill, eel.
>
> The D.O. at the time of discovery was very low, 0.4 ppm at the dam (57 Avenue) and 0.8 ppm at 67 Avenue. This would indicate a possible zero reading of oxygen the preceding night. The day before the kill was found, many distressed fish were gulping for air, which would indicate oxygen problems.

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* **Reference to Bibliography of Report**

> A large kill was reported on September 16, 1970 in the Hialeah area. This was in the Gratigny Canal (W. 68th). Thousands of threadfin shad were found as well as gizzard shad, mullet, largemouth bass, bluegill.
>
> On September 17, 1970, a check of the D.O. showed a high of 4.5 ppm and a low of 1.5 ppm from the Palmetto Expressway to Red Road. The average D.O. was 3.1 ppm. Several complaints were received of dead fish in the Red Road canal near Gratigny Canal (9/17/70) and were probably related. Near 7218 Red Road hundreds of large mullet were seen along with gizzard shad and threadfin shad.
>
> The D.O. in this area was 3.5 ppm. Many fish were seen in apparent good health a short time after the kill was reported.................."

3. Five major canals surveyed contained significant amounts of benthal material attributable to sewage treatment plants. (See Appendix B - Sludge Bank Data)

4. The effect that local canals and sewage treatment plant outfalls have on Biscayne Bay has been demonstrated by several random sampling programs carried on earlier in the year by University of Miami graduate students. (See Appendix E)

Short-term sampling programs in Biscayne Bay at best indicate a need for a more in-depth study. However, it is believed that danger areas were found. One of the sampling locations at Dumbfoundling Bay near Terracina Avenue in the area of Golden Beach showed total coliform counts on two different occasions to be 1,880 and 10,000. Another station in Maule Lake showed counts of 1,000, 2,000, and 1,460. The indication is that Biscayne Bay should be monitored by the appropriate governmental agency.

5. The effect of dumping millions of gallons of raw or partially treated sewage off the coast can be seen by the many sewage-related articles which from time to time wash up along Miami Beach and the very high offshore bacterial counts. Several preliminary studies have indicated that these wastes are not accepted by the Gulf Stream, as was hoped, but are entrained in the narrow band of coastal waters.

SEPTIC TANKS

Septic tanks account for much of the treatment of sewage in the Dade area; approximately 53 per cent of the county residents utilize this method. In 1966 the poorly treated effluents of septic tanks were in excess of 55 million gallons, and in relation to this, a recent thesis by T. P. Jackivicz at the University of Miami pointed out that the presence of septic tanks adjacent to waterway systems is accompanied by significantly higher levels of pollutive substances in the waterways.

The effluent from septic tanks has the ability to move laterally and vertically in the soil. With a ground water table that is just several feet below the ground surface coupled with Dade's pourous limestone and fissured rock, serious hazards to public health can exist. Not only does the wastewater receive very little filtration before entering the aquifer, but during long rainy periods the ground water table can in some areas rise to the surface and carry with it the effluent from a septic tank. Jackivicz found coliform counts in canals adjacent to septic tanks to be significantly higher than those in areas serviced by sanitary sewers.

SEWAGE TREATMENT PLANTS

The problems faced by Dade County treatment plants are basically twofold; many of the plants are overloaded and/or are improperly equipped and maintained. Bearing in mind that Dade's population is at its lowest during the summer months, a July 1970 report showing the monthly average flow rates for 69 of the larger plants in the county revealed 19 per cent to be operating at over 100 per cent capacity. This would also mean that during peak flows these plants could possibly be operating at two to three times their capacity. The respective hydraulic loadings reported by various overloaded plants are given as follows as a per cent of design capacity:

Golden Isles	150%
Hialeah Palm Springs Shopping Center	169%
Peninsula (Snapper Creek)	105%
South Dade Labor Camp	200% (misrep[illegible] plant personnel)
Westwood Lakes #2	116%
Holiday Inn (Springs)	108%
Palm Springs North	115%
Community Utilities #2	170%
Lake Cecil "C"	101%
Riverdale	107%
Virginia Key	102%

The indications are that these plants should be carefully investigated to ascertain the effects brought about by their reported conditions of hydraulic overload. In addition the majority of small plants cannot or will not report their flows, so it must be assumed the percentage of overloaded plants is greater than indicated.

In addition, many of the plants have antiquated equipment and function with various portions of the unit operations shut down. A typical reason for this has been the reluctance of owners to purchage needed equipment for the proper utilization and adequate operation of the plant.

Finally, many operators, although conscientious, do not have the proper equipment or training to operate a system as complex as a sewage treatment plant. Unfortunately, much of the responsibility for pollution has been unjustifiably placed on the operators.

GO TO [illegible] 3 [illegible]

(See Appendix A)

POLLUTION IN DADE COUNTY: INTRODUCTION

Much of the data on which this report is based has been gathered by University of Miami Civil Engineering graduate students. It is not designed to be an in-depth study. It is designed to reflect random conditions found in the field.

A two week random sampling program of treatment plants was carried out to demonstrate random conditions in sewage treatment plants as regards violations of the various laws currently in effect. While the results of "grab sample" techniques may not represent the average daily or weekly conditions in any one plant a preponderant number of violations indicated by such a program will not only lead to the identification of "trouble spots", but will indicate the need for in-depth analysis and a positive enforcement program.

A compilation of additional data that are pertinent to the county-wide pollution picture is given in the appendicies of this report.

DEVELOPMENT OF THE RANDOM SAMPLING PROGRAM

In September of this year a course in the field of environmental pollution control was offered to graduate students in engineering at the University of Miami.

One of the projects assigned set the criteria of developing a field testing team approach for performing sampling at sewage treatment facilities with the following constraints: (A) Sampling should involve physical, chemical and bacteriological analysis; (B) Grab samples were to be taken in the initial program to pinpoint appropriate violations of present codes; (C) Prime consideration should be given to representative sampling, accuracy, precision and speed.

A team of four graduate students (with the course instructor to act as referee) was formed and (after displaying their capabilities for proper field sampling techniques) a series of plant visits were scheduled. Random sampling times were chosen for testing the effluents of approximately one-third of the treatment plants of Dade County.

PROGRAM FINDINGS

The following summarizes the random sampling program.

Plant Name	Possible Violations	Remarks
Community (South)	Cl_2 residual = 0.2 Total coliforms = 400,000 Fecal coliforms = 35,000	0.5 mg/l required 1,000 is upper allowable Fecal contamination of waterway Flow = 170% of design at sampling time
Florida Processing		REFUSED ENTRANCE Very strong odors
Westwood Lakes		REFUSED ENTRANCE Gross discoloration of receiving waterway
Seaboard	Turbidity = 200 Total coliforms = 200,000+ Fecal coliforms = 10,000+ Settleable solids = 1.5	1,000 is allowable Fecal contamination
Golden Isles	Total coliforms = 4,000 Fecal coliforms = 180	1,000 allowable Fecal contamination Flow = 150% of design at sampling time
Miami Lakes	Turbidity = 280 Settleable solids = 40 Total coliforms = 1,000,000+ Fecal coliforms = 500,000 Cl_2 residual = 0.2	Gross pollution Definite health hazard Definite health hazard 0.5 required
Virginia Key	Total coliforms = 6500 Fecal coliforms = 750	Indicating possible need for additional chlorination
Carol City	Settleable solids = 2	
Shores Apts.	B.O.D. (effluent) = 150+ Settleable solids = 40+ Total coliforms = 100,000 Fecal coliforms = 40,000	All data indicating gross pollution. While we were REFUSED ENTRANCE samples were taken from plant prior to discharge into waterway
Westchester Hosp.	Settleable solids = 4 Turbidity = 115 Cl_2 residual = 0.3 Total coliforms = 20,000 Fecal coliforms = 200	Gross pollution 0.5 required 1,000 allowable Health hazard Large amount of floating solids going out of plant

Plant Name	Possible Violations	Remarks
Palm Springs Condominium	Settleable solids = 500+	Gross pollution
	Turbidity = 1,000+	Gross pollution
	Cl_2 residual = 0	Definite health hazard
	Total coliforms = 3,000,000+	Definite health hazard
	Fecal coliforms = 300,000+	Definite health hazard
		Large quantity of pollution escaping plant
K-Mart	Turbidity = 100	Broken flow meter
Hialeah Convalescent Home	Cl_2 residual = 0	0.5 required
	Total coliforms = 1,000,000+	Definite health hazard
	Fecal coliforms = 200,000+	Definite health hazard
		Chlorine tank empty
Palm Springs North Outfall	Settleable solids = 11	Gross pollution
	Turbidity = 80	
	Total coliforms = 50,000	1,000 allowable
	Fecal coliforms = 20,000+	Definite health hazard
		Waterway being discolored significantly.
		Suds at outfall line
Lake Cecil Outfall	Settleable solids = 10	Gross pollution
	Turbidity = 115	
Lakeview Garden Apts.	Cl_2 residual = 0	Definite health hazard
	Total coliforms = 500,000	1,000 allowable
	Fecal coliforms = 1,000	Health hazard
		Chlorine tank empty
Airport Crossway Inn	Cl_2 residual = 0	Chlorine not even connected Definite health hazard
	Total coliforms = 5,000,000+	Definite health hazard
	Fecal coliforms = 3,000,000+	Definite health hazard
Holiday Inn (Miami Springs)	Settleable solids = 200+	Gross pollution
	Turbidity = 375	
	Cl_2 residual = 0.1	0.5 required
Howard Johnsons	Cl_2 residual = 0	No chlorine being applied
	Total coliforms = 3,000,000+	Definite health hazard
	Fecal coliforms = 300,000+	Definite health hazard
Sheraton Beach		Trickling filter being effectively bypassed because of breakdown

Based on evaluation of the above data (as regards the definitions of gross pollution and health hazards) it would appear possible to bring at least 40 charges against various plant owners and operators, with a very high probability of successful court adjudication, and the remaining 12 charges with a moderate probability of success (no suspended sentences after ajudication of guilt).

The complete set of data collected are given in Appendix A. A discussion of the findings follows.

Out of the thirty plants visited and the twenty-six ultimately sampled, nine plants had appreciable settleable solids attributable to sewage while one plant had solids in excess of five hundred ml/l.

If a medium size treatment plant of 500, 000 gal. per day flow were to discharge twenty ml/l of settleable solids in one day, it would discharge approximately ten thousand gallons of sewage solids into a waterway, and in one year would discharge over 3. 5 million gallons of solids into this same waterway. The sludge deposits produced by these discharged solids will, and do, have a degrading effect on the canal or waterway long after the source of pollution has been corrected. From the previous figures, one can easily understand how the large volumes of sludge deposits given in Appendix B could have accumulated.

Secondly, eight of the twenty-six plants sampled, were judged to be poor in general appearance, either because of outdated improperly operating equipment or from the lack of proper maintenance and cleanliness.

In addition, ten plants had turbidity values greater than 50 JTU. The turbidity, of course, is related to the solid matter in the water, and reduces the light penetration in the receiving waterway, and adversely affects the ability of the plant life to carry on photosynthesis.

Finally, and most disturbing of all, twelve of the plants sampled had chlorine residuals of less than 0. 5 ppm. In addition to violating the law, this indicates that these plants are discharging large quantities of potentially harmful bacteria into the adjacent waterway, as evidenced by the associated high coliform counts. It is felt by the writers, that since the maintenance of a chlorine residual is such a simple and effective method of controlling a possibly dangerous health hazard, pollution control inspectors should have the authority to issue citations, similar to traffic citations, to all violators of the law relating to maintaining an adequate chlorine residual.

STUDENTS' RECOMMENDED CORRECTIVE MEASURES

(1) Proper Enforcement

A. A monitoring system that would yield pollution information on Biscayne Bay and ocean beaches should be established.

B. Establish an adequate, comprehensive training program for pollution control inspectors.

C. Recommendations by the Pollution Control Officer should be promptly considered for incorporation into the county ordinance.

(2) Master Plan

A. Because population growth rate is so closely related to increasing pollutional levels, tighter controls are required to restrict the county growth rate and overall population density.

B. In addition, the Master Plan should provide for:

1. The elimination of the use of septic tanks in Dade County.

2. Halting the proliferation of small, package sewage treatment plants in order to establish a more economical system of larger, strategically located sewage treatment plants.

3. A moratorium on the issuance of building permits and additional tie-ins where the adjacent sewage treatment plant is approaching maximum capacity.

4. A nearly potable effluent from all sewage collected in Dade County systems with emphasis placed on reuse.

(3) Education

A. Provide courses to familiarize sewage treatment plant operators with the problems of treatment systems.

1. Include instruction in the basic chemical analysis related to sewage treatment.

B. Influence legislators to get needed laws passed and enforced. Make them more aware of the problems!!

C. Educate, to a greater degree, the general public in the problems and consequences of local pollution.

ENFORCEMENT

The past enforcement activities of the Dade County Pollution Control Department are difficult to evaluate due to obvious false claims. The previous pollution control officer, in mid-1969 addressed the Inter-Professional Council regarding water pollution control efforts in Dade County and stated that his office currently had "over 70 wins" in the courts. On a radio interview on WVCG, at a later date, the same pollution control officer, when asked about his water pollution court record, stated that "we've just recently won another and that brings our record up to thirty straight". Several months later, in a reply to a blistering Grand Jury report, the same pollution control officer listed fourteen convictions (of 26 possible) against water pollution defendants and a total of $2,700 in fines.

These contradictory facts are on record and, if we assume the most recent report (14 wins) is true, we find an indication of the great need we have in Dade County for assistance from any and all interested agencies on the local, State and Federal levels. It is in this respect that we seek your assistance.

APPENDIX A

Random Sampling Data-Sewage Treatment Plants

Data Collected from 10/8-10/18/70

Plant Name	B. O. D.	Turbidity JCU	Settleable Solids ml/1	Coliform Total	Coliform Fecal	Cl$_2$ ppm	Noxious Odors	% Capacity (Dry weathe - average day of month)	Physical Appearance
Community (South)	16 ppm	25	0.5	400,000	35,000	0.2	Slight	170%	Fair
Community (North)	10 ppm	5	0	0	0	4.0	Slight	100%	Good
Florida Processing		REFUSED ENTRANCE					Odor very strong		
Westwood Lakes		REFUSED ENTRANCE					Moderate	116%	
Seaboard	-	200	1.5	200,000	10,000	-	Moderate	63%	Good
Golden Isles	-	25	0.3	4,000	180	0.5	Slight	150%	Fair
Palm Springs North	-	15	0	0	0	2.8	None	115%	Good
Miami Lakes	-	280	40	1,000,000+	500,000+	0.2	Slight	52%	Good
Virginia Key	-	-	-	6,500	750	-	Strong	-	Good
Carol City	-	65	2	0	0	2.0	Slight	86%	Good
Myrtle Groce	-	25	0.5	0	0	3.9	Moderate	63%	Poor
Shores Apts.	150+	REFUSED ENTRANCE	40+	100,000	40,000	-	Slight	-	Poor
Westchester Hosp.	-	115	4	20,000	200	0.3	Moderate	-	Poor
Palm Springs Condominium	-	1000+	500+	3,000,000+	300,000+	0	Strong	-	Poor
Burdines	-	15	0	-	-	1+	None	-	Good
Palm Springs Hosp.	Clear eff.			-	-	1+	Slight	-	Fair

Plant Name	B. O. D.	Turbidity JCU	Settleable Solids ml/1	Coliform		Cl$_2$ ppm	Noxious Odors	% Capacity (Dry weather - average day of month)	Physical Appearance
				Total	Fecal				
K-Mart	-	100	0.5	-	-	1+	None	-	Good
Delray Gardens	-	Clear effluent		-	-	1+	None	-	Good
Hialeah Convalescent Home	-	Clear effluent		1,000,000+	200,000+	0	Moderate	-	Poor
Kings Point	-	15	Trace	-	-	1+	Slight	-	Fair
Coastal Towers	-	20	Trace	-	-	1+	None	-	Good
Palm Springs North (outfall)	-	80	11	50,000	20,000+	-	-	-	-
Lake Cecil (outfall)	-	115	10	0	-	-	-	-	-
Lakeview Gardens Apts.	-	Clear effluent		500,000	1,000	0	None	-	Good
Peninsular Utilities	-	Sudsy effluent		-	-	-	Slight	-	Good
Airport Crossway Inn	-	Low flow		5,000,000+	300,000+	-	Slight	-	Fair
Holiday Inn	-	375	200+	0	0	0.1	Moderate	-	Fair
Howard Johnsons	-	75	Trace	3,000,000+	300,000+	0	Moderate	-	Poor
Sunny Isles	-	15	0	-	-	-	Moderate	-	Poor
Sheraton Beach	-	Low flow (clear)		-	-	1+	Slight	-	Poor

APPENDIX B

Sludge Bank Data

TABLE: Total Volume of Sludge in Five Major Dade County Canals

Typical Sludge Cross-Sections

SLUDGE BANK STUDIES

CANAL	Sludge Volume	Max Sludge Depth	Max Water Depth
Gratigny	246,000 gal.	4.5 ft.	20 ft.
Myrtle Grove Effluent Canal	3,170,000 gal.	5 ft.	6 ft.
Community Utilities Effluent Canal +	709,000 gal.	9 ft.	18 ft.
Coral Gables Canal	262,000 gal.	2.5 ft.	15 ft.
Oleta River	510,000 gal.	4 ft.	9 ft.
Carol City Effluent Canal	742,500 gal.	4 ft.	-

Gratigny Canal Survey 9/28/70 Dade County Pollution Control

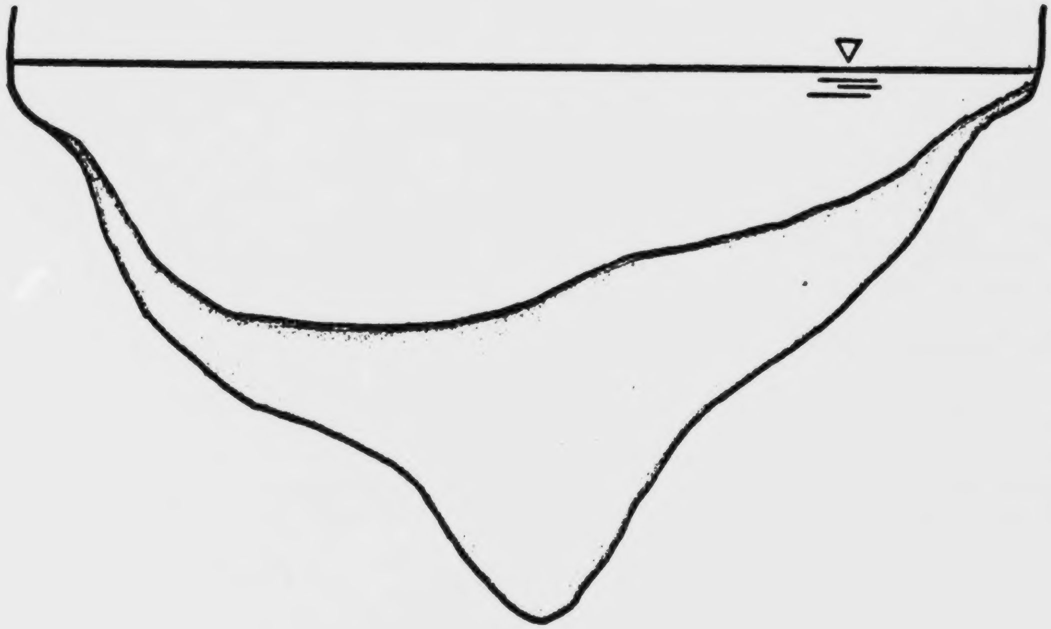
Carol City Canal Survey 2/2/70 Dade County Pollution Control

Reference 4 See Bibliography

STATION 5 Community Utilities Effluent Canal

Cross-sectional area of sludge = 95 Sq. Ft.

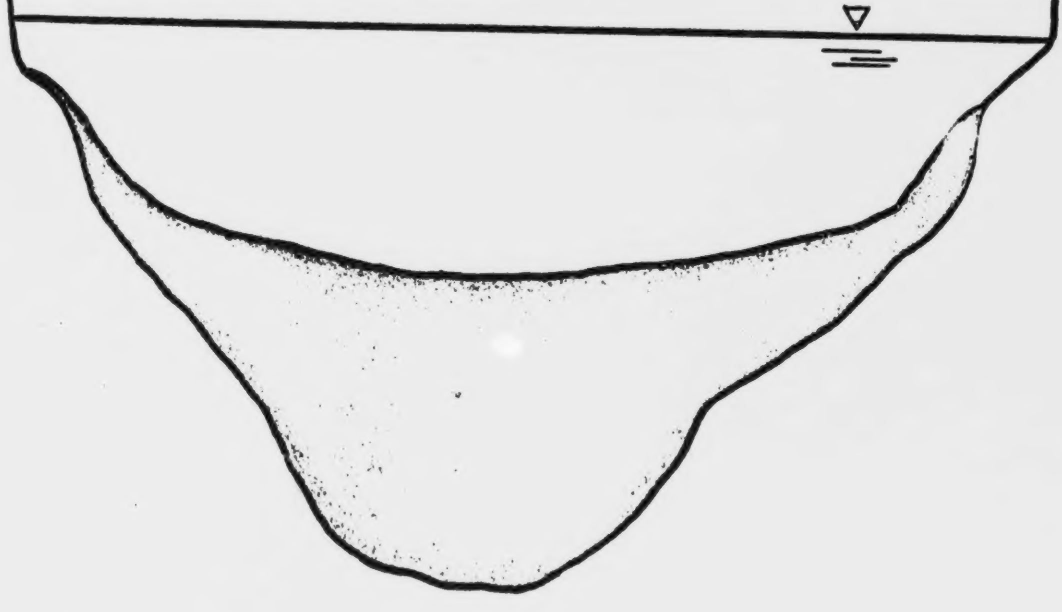
Max. water depth = 16 Ft. Max. sludge depth = 9 Ft.



STATION 6

Cross-sectional area of sludge = 135 Sq. Ft.

Max. water depth = 16 Ft. Max. sludge depth = 9 Ft.

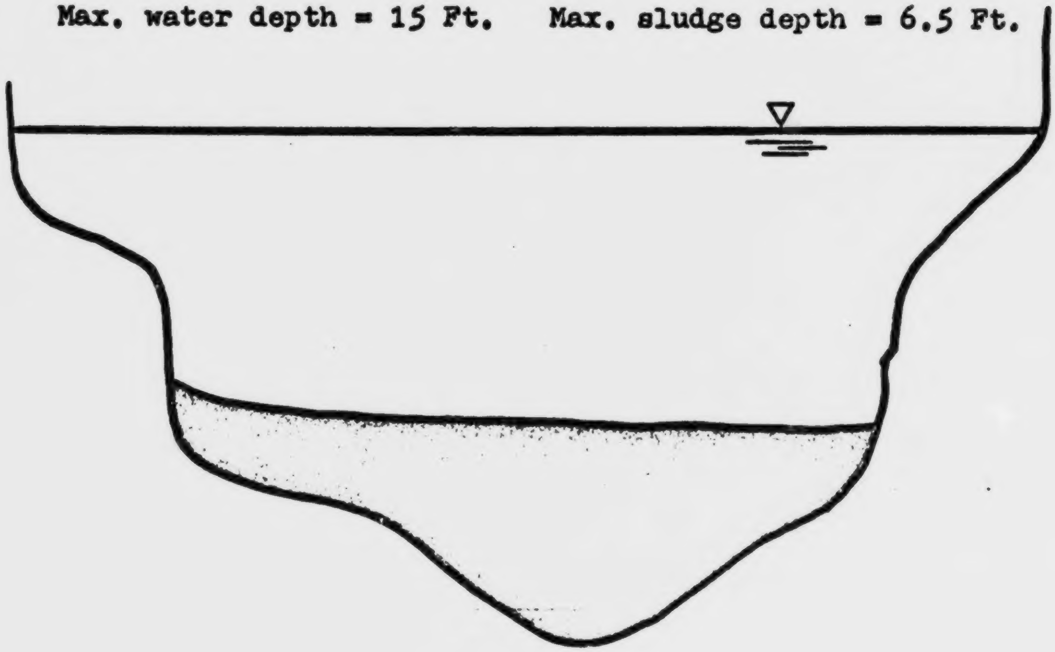


Community Utilities Effluent Canal

STATION 7-NORTH

Cross-sectional area of sludge = 76 Sq. Ft.

Max. water depth = 15 Ft.   Max. sludge depth = 6.5 Ft.

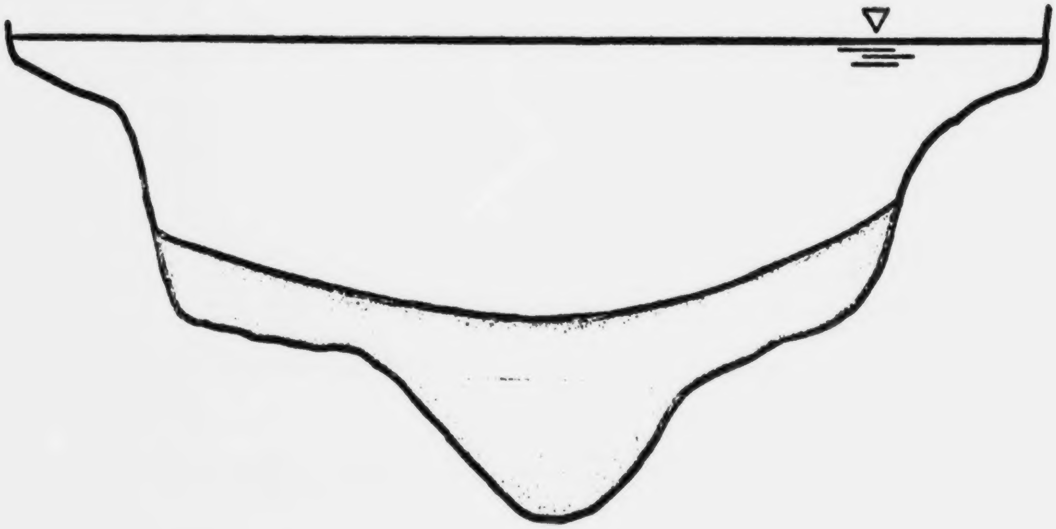


Community Utilities Effluent Canal

STATION 7-SOUTH

Cross-sectional area of sludge = 65 Sq. Ft.

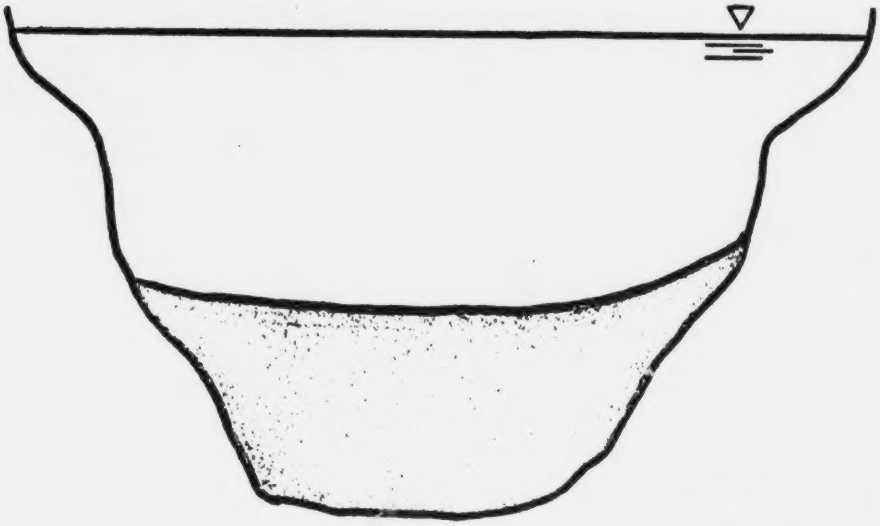
Max. water depth = 14 Ft.   Max. sludge depth = 6 Ft.



STATION 8

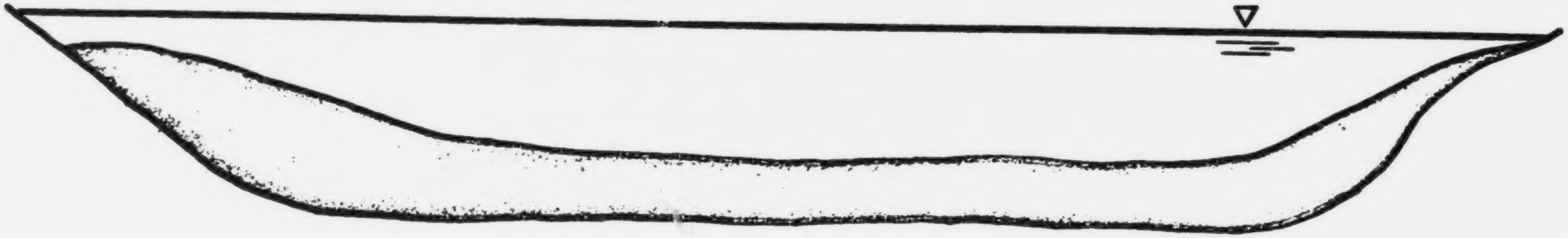
Cross-sectional area of sludge = 80 Sq. Ft.

Max. water depth = 14 Ft.   Max. sludge depth = 6 Ft.



Golden Isles Effluent Canal - Oleta River

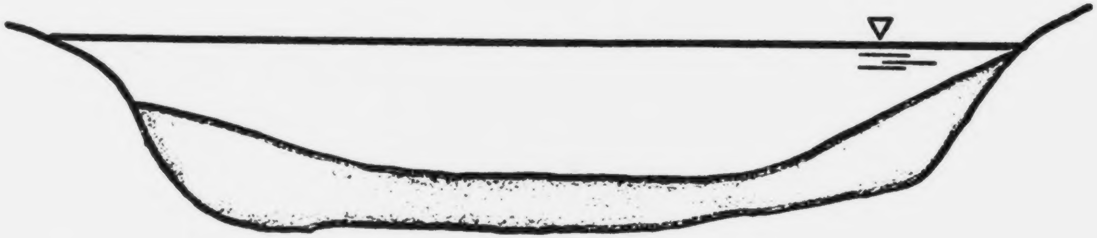
Station 11



Cross-sectional area of sludge = 89 Sq. Ft.

Max. sludge depth = 2 Ft. Water depth = 6 Ft.

Station 12

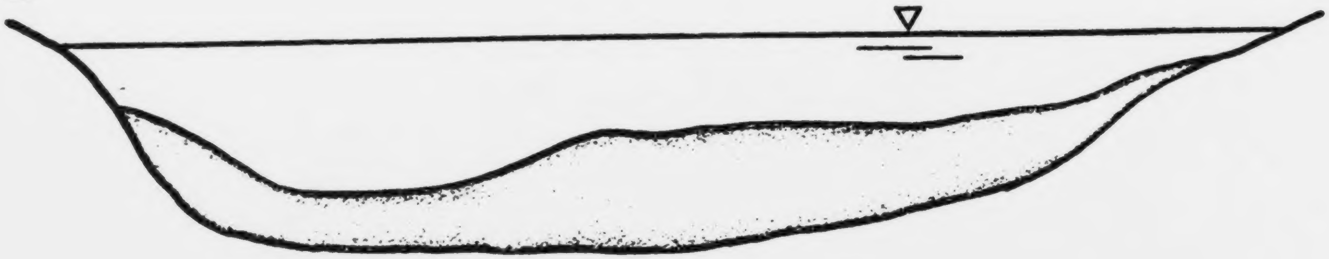


Cross-sectional area of sludge = 39 Sq. Ft.

Max. sludge depth = 2 Ft. Water depth = 6 Ft.

Golden Isles Effluent Canal - Oleta River

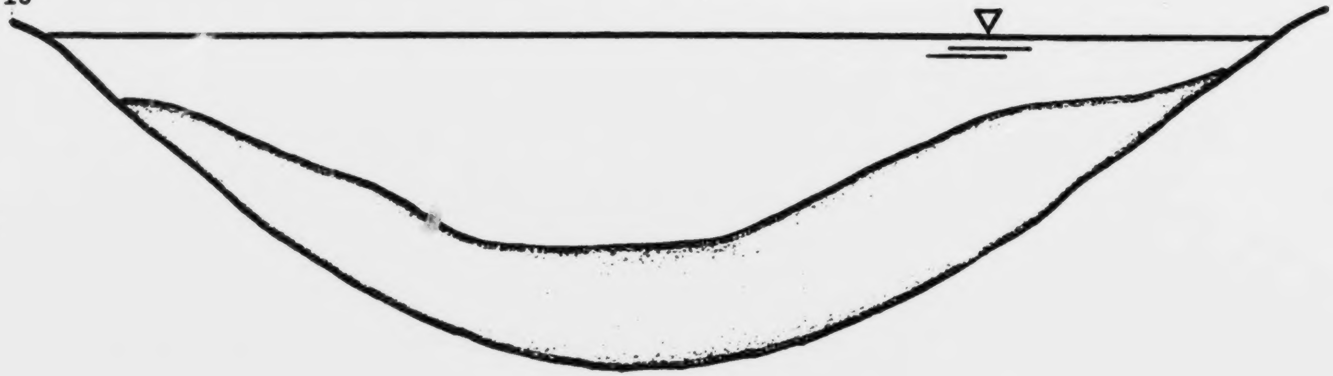
Station 15



Cross-sectional area of sludge = 64 Sq. Ft.

Max. sludge depth = 3 Ft. Water depth = 6 Ft.

Station 16

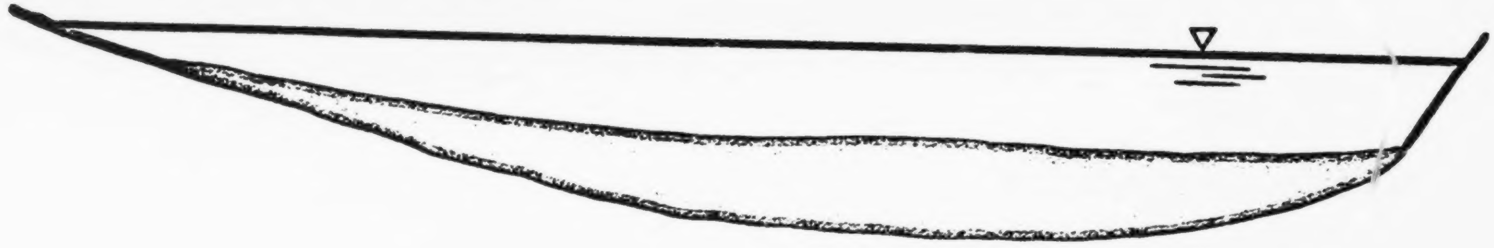


Cross-sectional area of sludge = 87 Sq. Ft.

Max. sludge depth = 4 Ft. Water depth = 9 Ft.

Myrtle Grove Effluent Canal

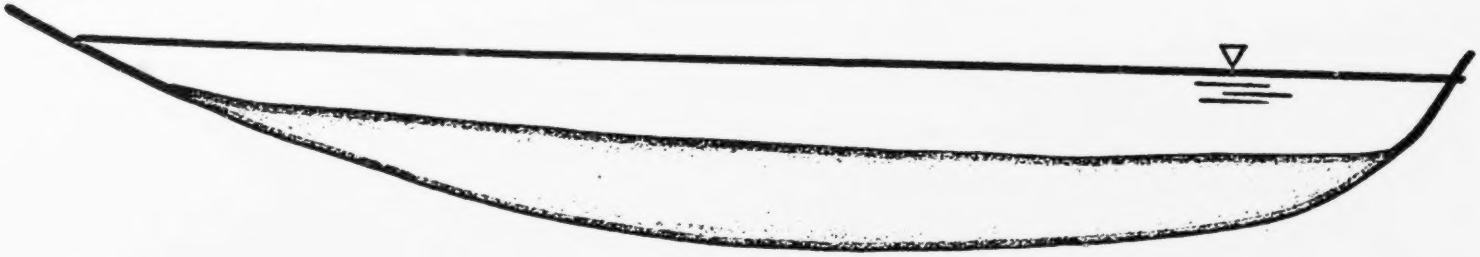
Station 25



Cross-sectional area of sludge = 56.5 Sq. Ft.

Max. sludge depth = 2 Ft. Water depth = 5 Ft.

Station 26

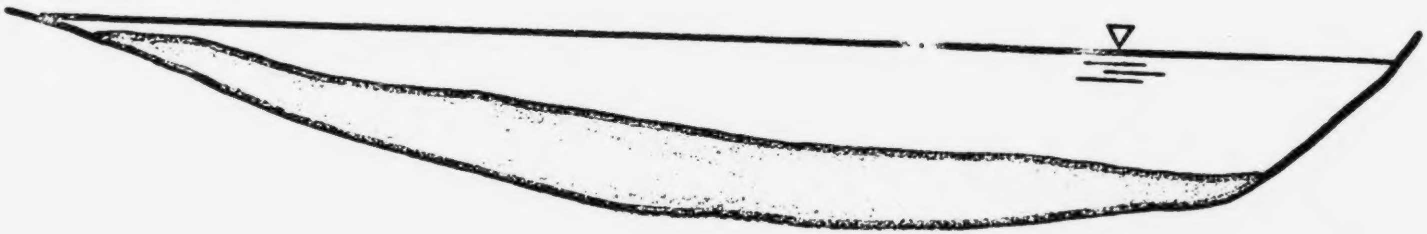


Cross-sectional area of sludge = 68 Sq. Ft.

Max. sludge depth = 2.5 Ft. Water depth = 5 Ft.

Myrtle Grove Effluent Canal

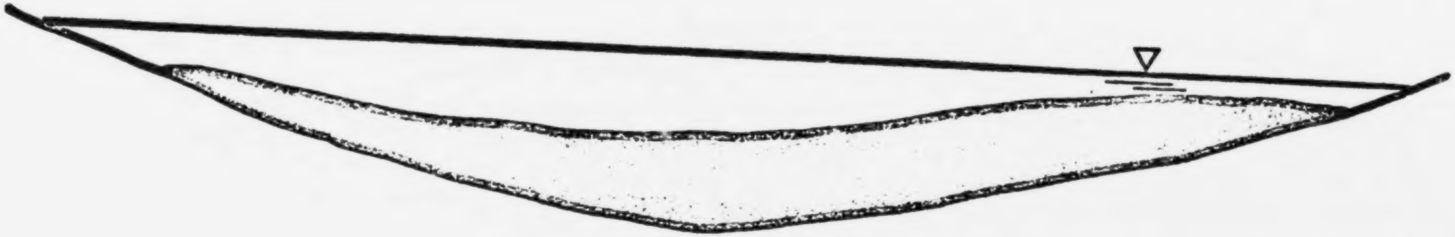
Station 27



Cross-sectional area of sludge = 56 Sq. Ft.

Max. sludge depth = 2.5 Ft. Water depth = 5 Ft.

Station 28



Cross-sectional area of sludge = 58 Sq. Ft.

Max. sludge depth = 2.5 Ft. Water depth = 5 Ft.

APPENDIX C

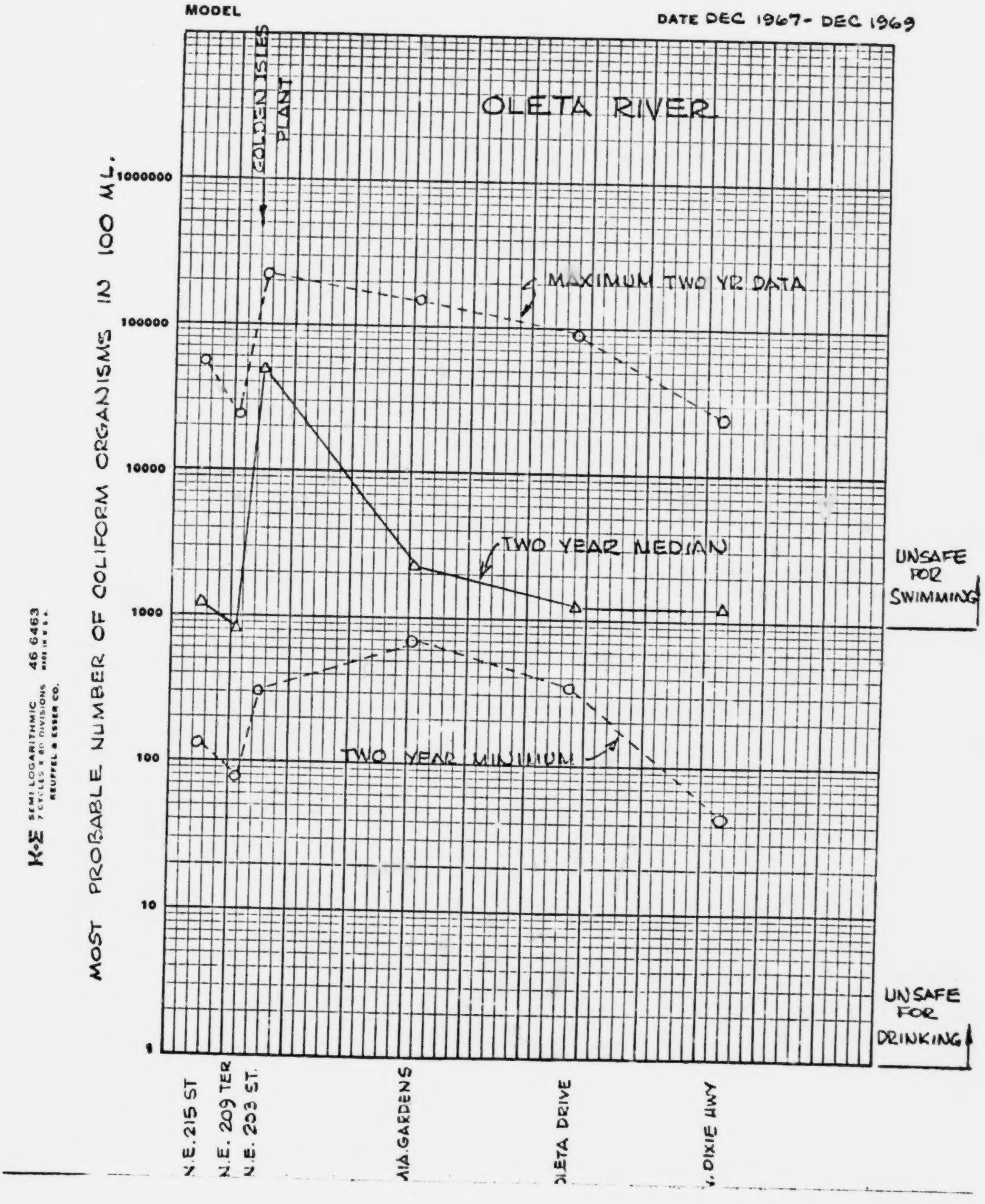
Most Probable Number of Coliform Organisms in 100 ml

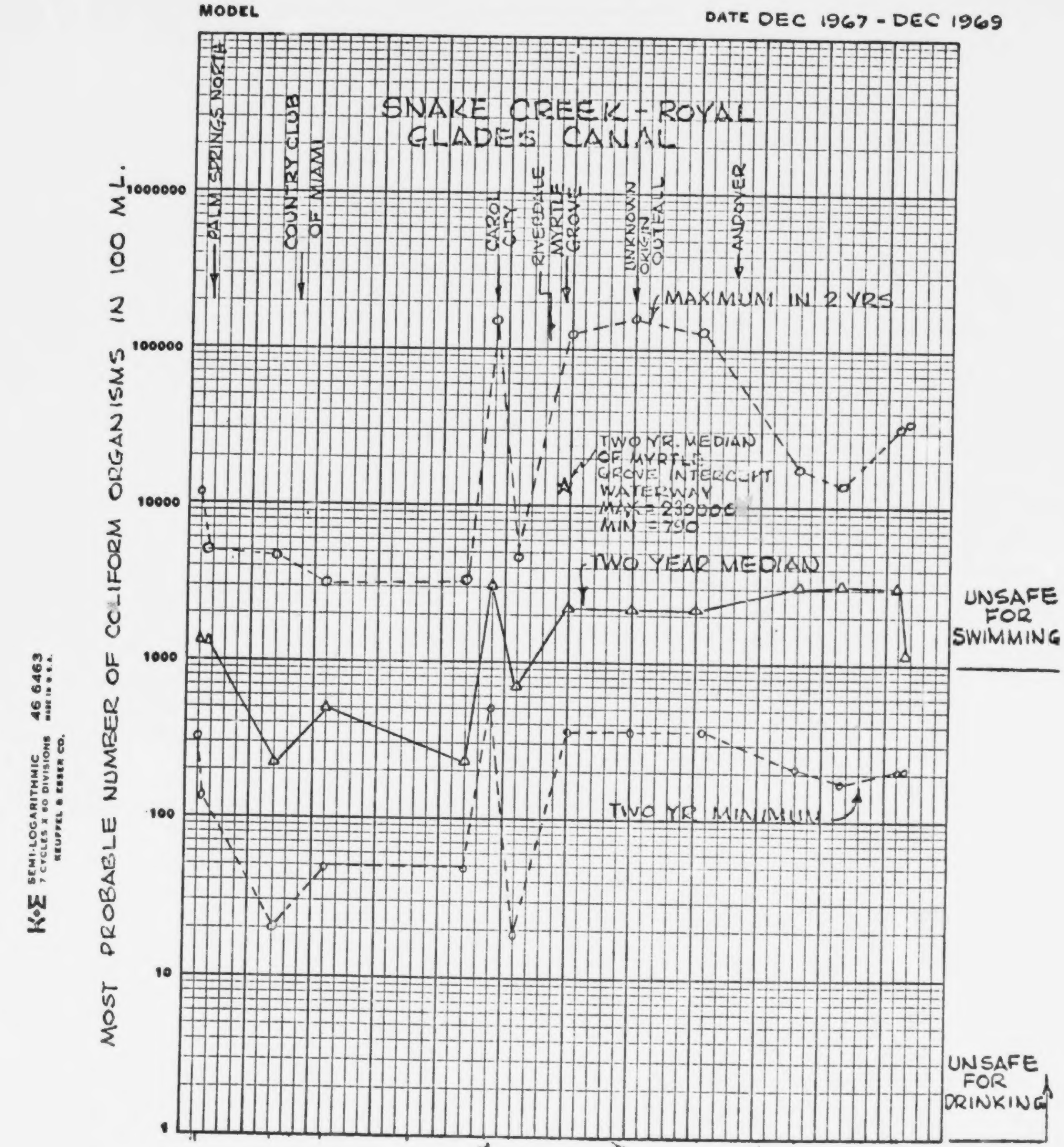
Dade County Pollution Control Canal Data
December 1967 to December 1969

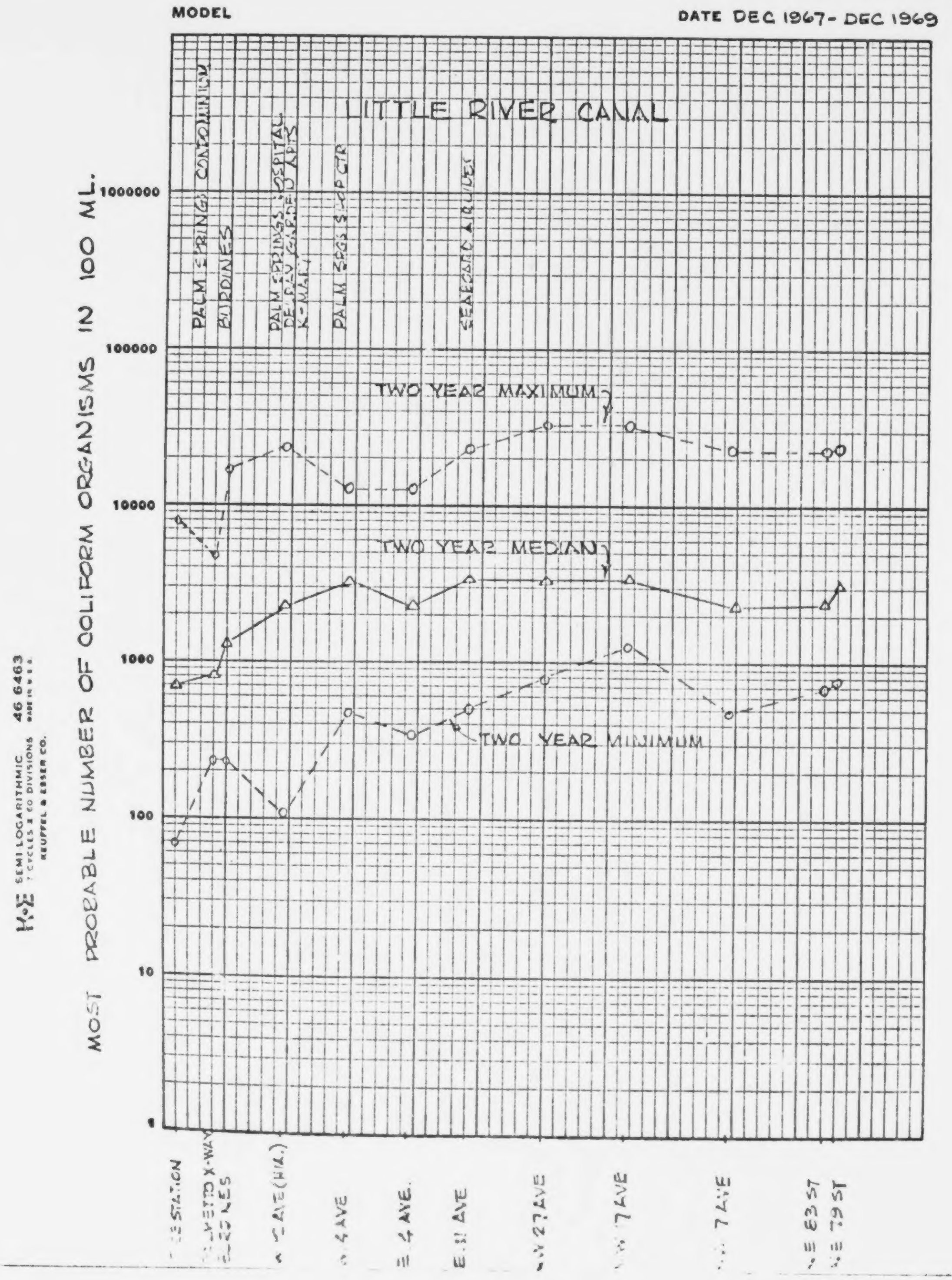
Graphs of Minimum and Maximum MPN Values

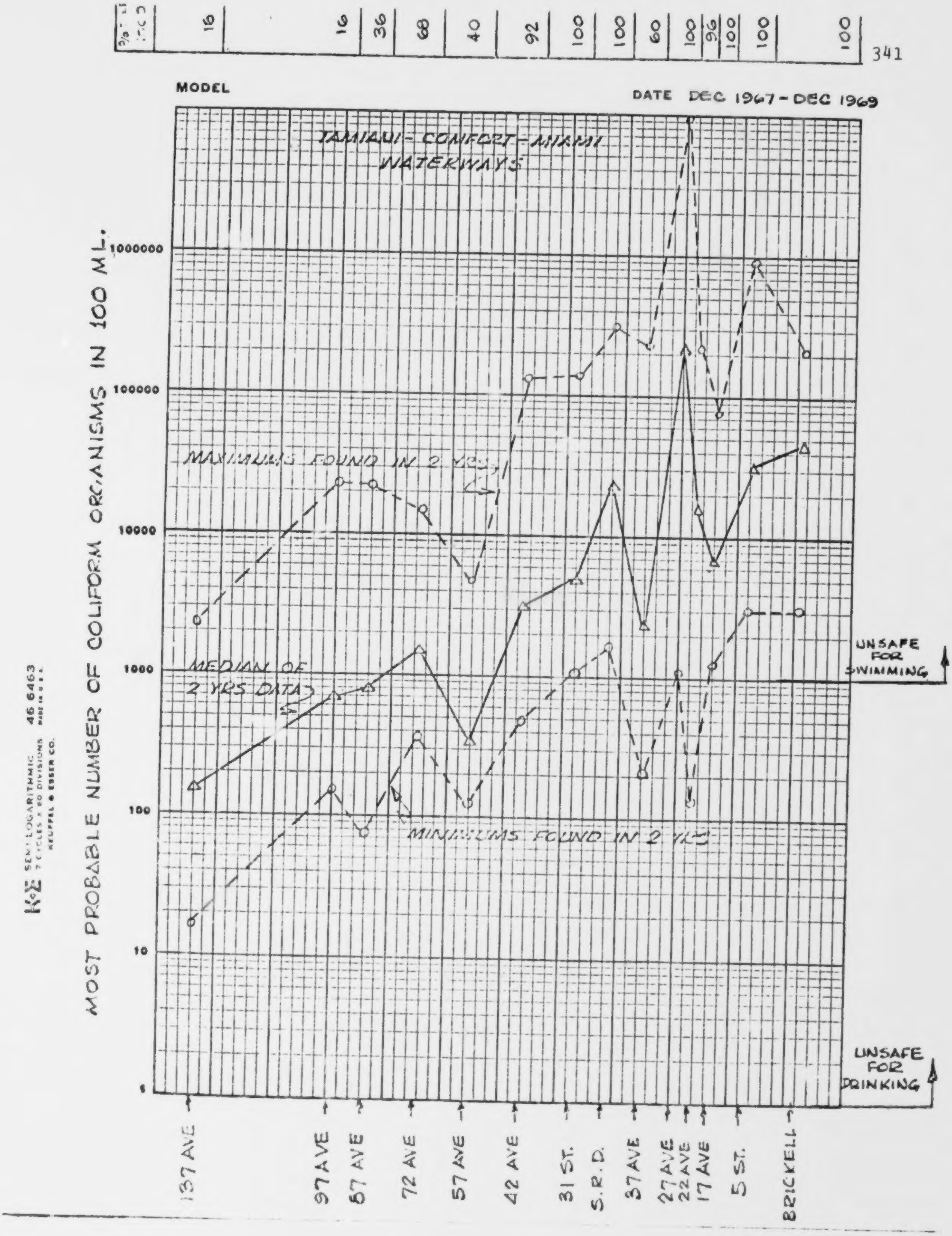
vs

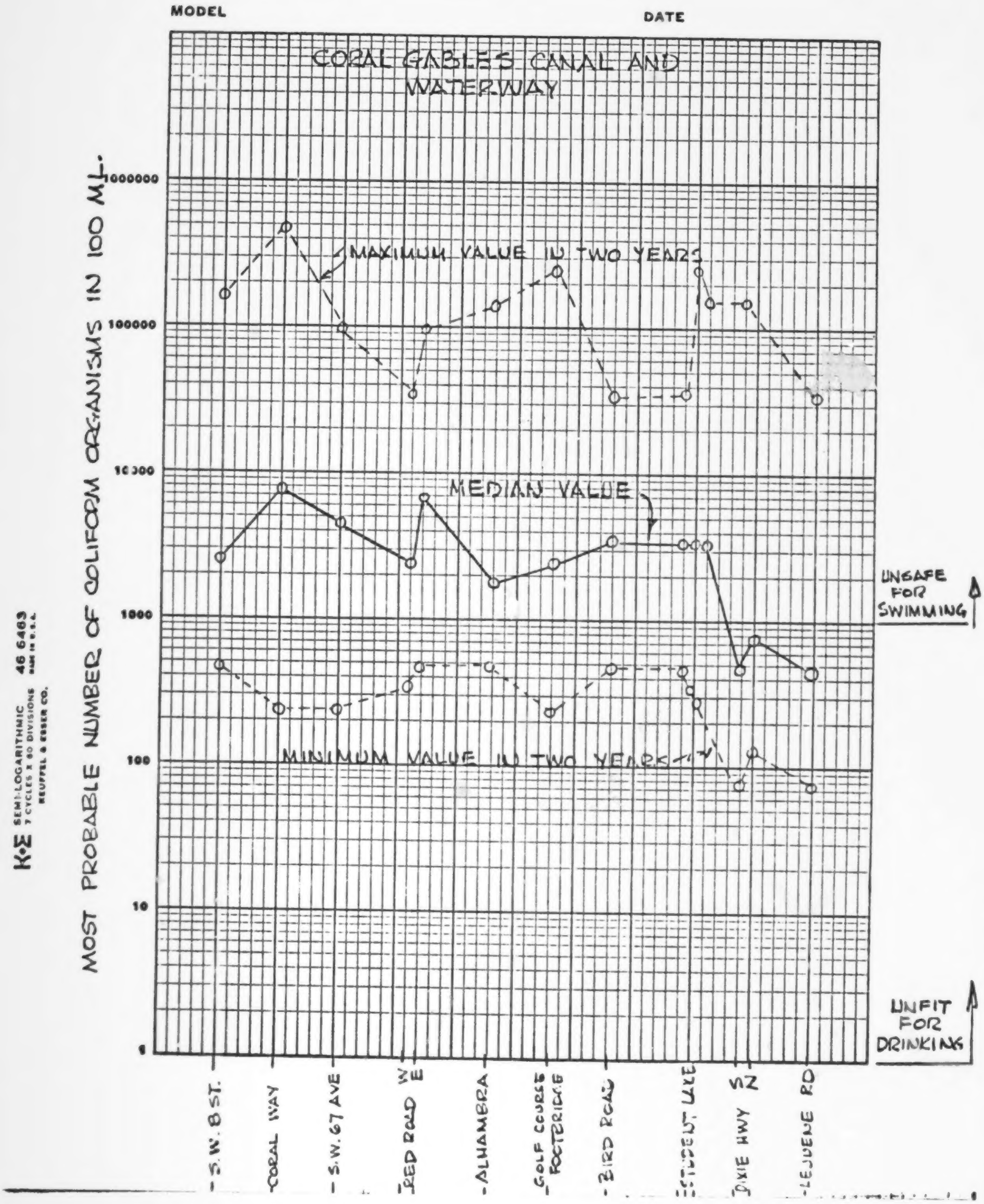
Stations

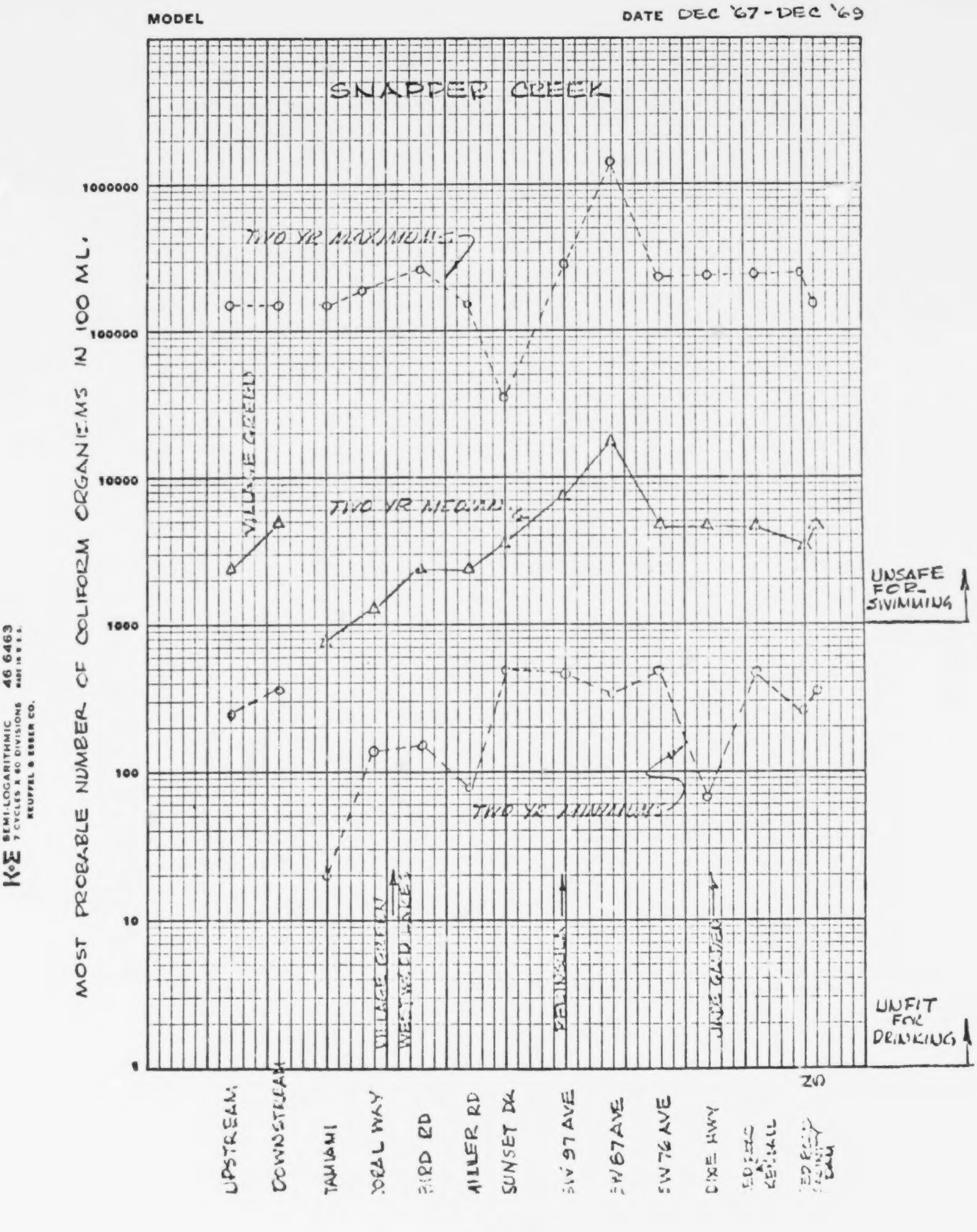

MODEL
DATE DEC 1967- DEC 1969
OLETA RIVER
GOLDEN ISLES PLANT
MAXIMUM TWO YR DATA
TWO YEAR MEDIAN
TWO YEAR MINIUUM
UNSAFE FOR SWIMMING
UNSAFE FOR DRINKING
MOST PROBABLE NUMBER OF COLIFORM ORGANISMS IN 100 ML.
1000000
100000
10000
1000
100
10
1
N.E. 215 ST
N.E. 209 TER
N.E. 203 ST.
AIA GARDENS
OLETA DRIVE
N. DIXIE HWY
K&E SEMI-LOGARITHMIC 7 CYCLES X 60 DIVISIONS KEUFFEL & ESSER CO. 46 6463 MADE IN U.S.A.

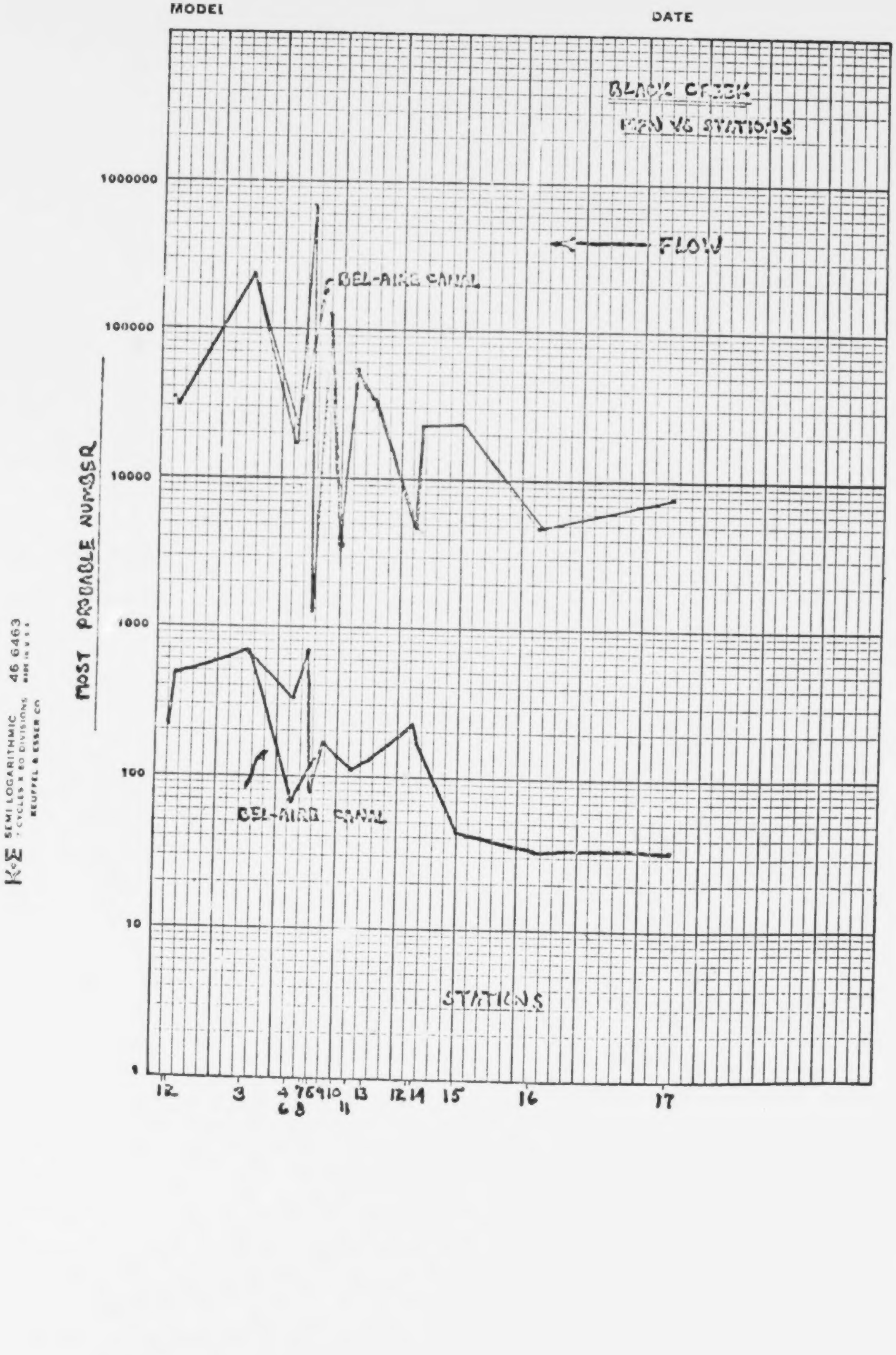

MODEL
DATE DEC 1967 - DEC 1969
SNAKE CREEK - ROYAL GLADES CANAL
MOST PROBABLE NUMBER OF COLIFORM ORGANISMS IN 100 ML.
1000000
100000
10000
1000
100
10
1
PALM SPRINGS NORTH
COUNTRY CLUB OF MIAMI
CAROL CITY
RIVERDALE
MYRTLE GROVE
UNKNOWN ORIGIN OUTFALL
ANDOVER
MAXIMUM IN 2 YRS
TWO YR. MEDIAN OF MYRTLE GROVE INTERCEPT WATERWAY
MAX = 230000
MIN = 790
TWO YEAR MEDIAN
TWO YR MINIMUM
UNSAFE FOR SWIMMING
UNSAFE FOR DRINKING
N.W. 175 ST
N.W. 179 ST.
N.W. 77 AVE
N.W. 67 AVE
N.W. 57 AVE
N.W. 47 AVE
CAROL CITY CANAL
N.W. 37 AVE
N.W. 27 AVE
SUNSHINE PKWY
ST. RD. 441
N.E. 183 ST
N.E. 170 ST.
DIXIE HWY W E
K+E SEMI-LOGARITHMIC 46 6463 7 CYCLES X 90 DIVISIONS MADE IN U.S.A. KEUFFEL & ESSER CO.

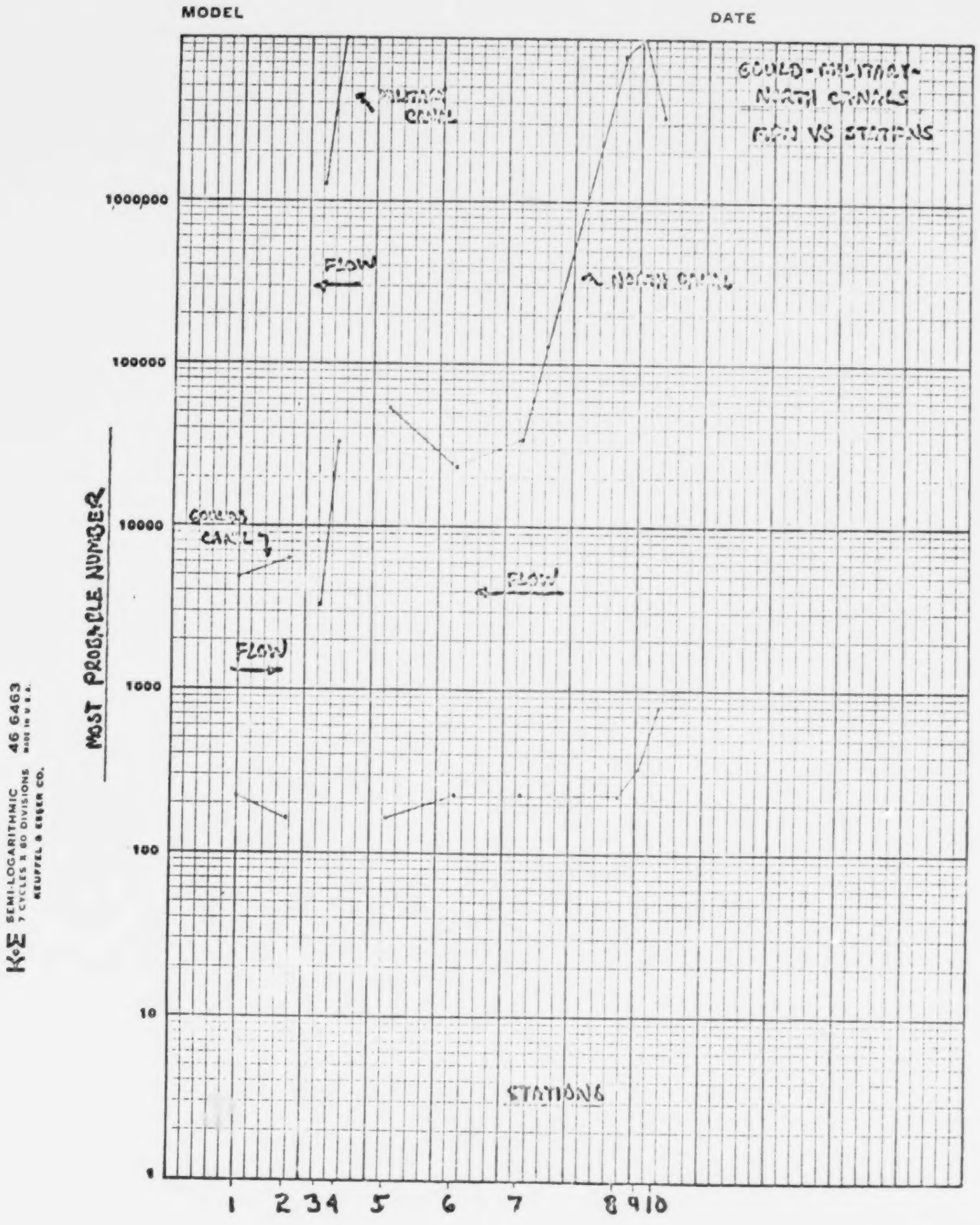

MODEL
DATE DEC 1967 - DEC 1969
LITTLE RIVER CANAL
PALM SPRINGS CONDOMINIUM
BURDINES
PALM SPRINGS HOSPITAL
DE PAV GARDEN APTS
K-MART
PALM SPGS SHOP CTR
SEABOARD AIRLINES
TWO YEAR MAXIMUM
TWO YEAR MEDIAN
TWO YEAR MINIMUM
MOST PROBABLE NUMBER OF COLIFORM ORGANISMS IN 100 ML.
1000000
100000
10000
1000
100
10
1
K&E SEMI-LOGARITHMIC 46 6463
7 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
E STATION
PALMETTO X-WAY
BURDINES
AVE (HIA.)
4 AVE
E 4 AVE.
E 11 AVE
NW 27 AVE
NW 7 AVE
7 AVE
NE 83 ST
NE 79 ST

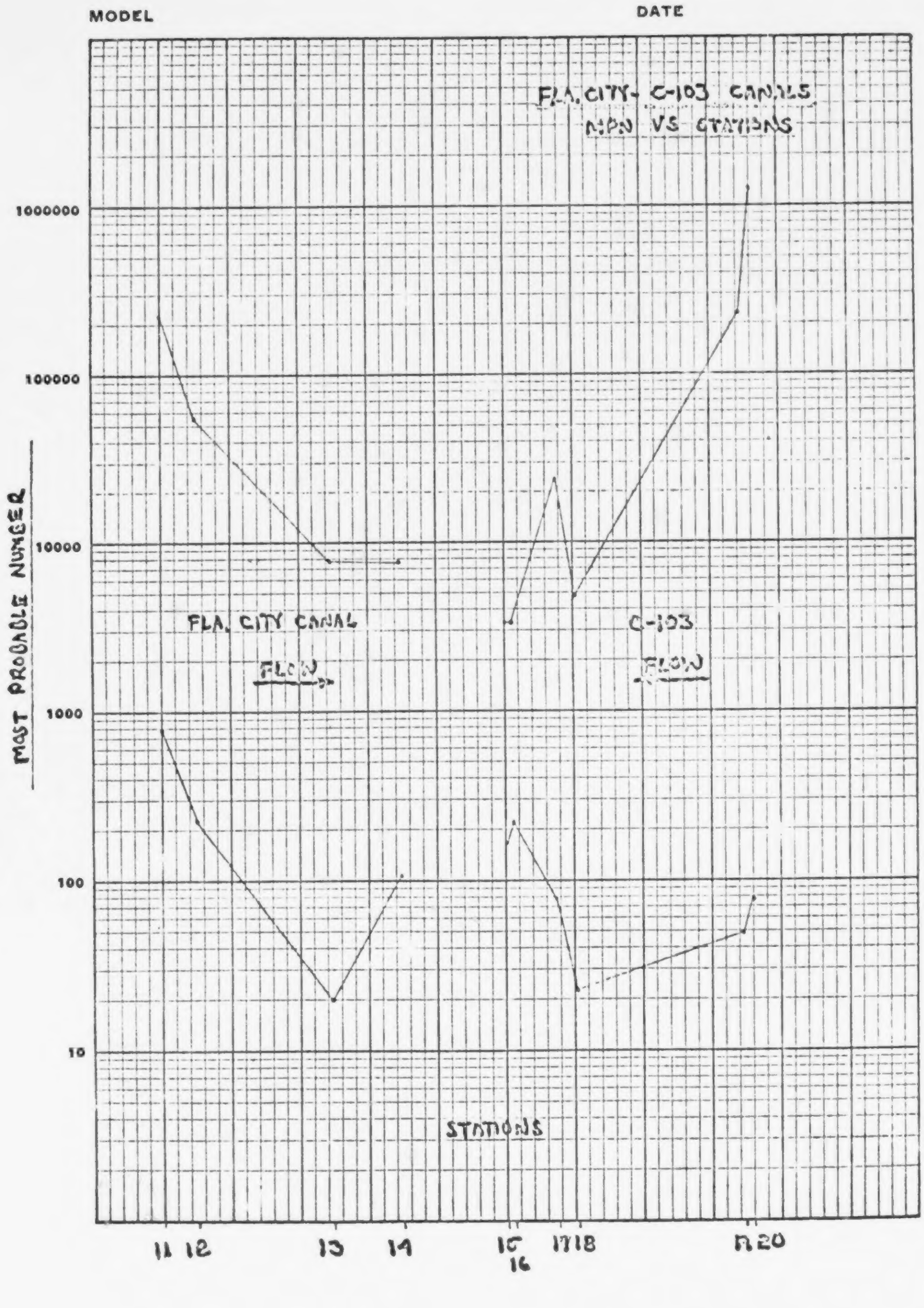

16
16
36
68
40
92
100
100
60
100
96
100
100
100
MODEL
DATE DEC 1967 - DEC 1969
TAMIAMI - COMFORT - MIAMI
WATERWAYS
MOST PROBABLE NUMBER OF COLIFORM ORGANISMS IN 100 ML.
1000000
100000
10000
1000
100
10
1
MAXIMUMS FOUND IN 2 YRS.
MEDIAN OF
2 YRS DATA
MINIMUMS FOUND IN 2 YRS
UNSAFE FOR SWIMMING
UNSAFE FOR DRINKING
137 AVE
97 AVE
87 AVE
72 AVE
57 AVE
42 AVE
31 ST.
S.R.D.
37 AVE
27 AVE
22 AVE
17 AVE
5 ST.
BRICKELL
K&E SEMI-LOGARITHMIC 46 6463
7 CYCLES X 60 DIVISIONS
KEUFFEL & ESSER CO.


MODEL
DATE
CORAL GABLES CANAL AND WATERWAY
MOST PROBABLE NUMBER OF COLIFORM ORGANISMS IN 100 ML.
1000000
100000
10000
1000
100
10
1
MAXIMUM VALUE IN TWO YEARS
MEDIAN VALUE
MINIMUM VALUE IN TWO YEARS
UNSAFE FOR SWIMMING
UNFIT FOR DRINKING
S.W. 8 ST.
CORAL WAY
S.W. 67 AVE
RED ROAD W E
ALHAMBRA
GOLF COURSE FOOTBRIDGE
BIRD ROAD
STUDENT LAKE
DIXIE HWY N S
LEJEUNE RD
K+E SEMI-LOGARITHMIC 46 6483
7 CYCLES X 60 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.


MODEL
DATE DEC '67 - DEC '69
SNAPPER CREEK
MOST PROBABLE NUMBER OF COLIFORM ORGANISMS IN 100 ML.
1000000
100000
10000
1000
100
10
1
TWO YR MAXIMUMS
TWO YR MEDIAN
TWO YR MINIMUMS
VILLAGE GREEN
VILLAGE GREEN
WESTWOOD LAKE
PALMETTO
JUNE GARDEN
UNSAFE FOR SWIMMING
UNFIT FOR DRINKING
20
UPSTREAM
DOWNSTREAM
TAMIAMI
CORAL WAY
BIRD RD
MILLER RD
SUNSET DR
SW 97 AVE
SW 67 AVE
SW 72 AVE
DIXIE HWY
FED HWY AT KENDALL
FED HWY DAM
K&E SEMI-LOGARITHMIC 7 CYCLES X 60 DIVISIONS 46 6463 MADE IN U.S.A. KEUFFEL & ESSER CO.


MODEL
DATE
BLACK CREEK
MPN VS STATIONS
FLOW
BEL-AIRE CANAL
BEL-AIRE CANAL
MOST PROBABLE NUMBER
STATIONS
1000000
100000
10000
1000
100
10
1
12
3
4
6
7
8
5
9
10
11
13
12
14
15
16
17
K&E SEMI-LOGARITHMIC 7 CYCLES X 60 DIVISIONS 46 6463 KEUFFEL & ESSER CO.


MODEL
DATE
GOULD-MILITARY-NORTH CANALS
MPN VS STATIONS
MILITARY CANAL
NORTH CANAL
GOULD'S CANAL
FLOW
FLOW
FLOW
MOST PROBABLE NUMBER
1000000
100000
10000
1000
100
10
1
STATIONS
1
2
3
4
5
6
7
8
9
10
K+E SEMI-LOGARITHMIC 46 6463
7 CYCLES X 60 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.



K+E SEMI-LOGARITHMIC 46 6463
7 CYCLES X 60 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.

APPENDIX D

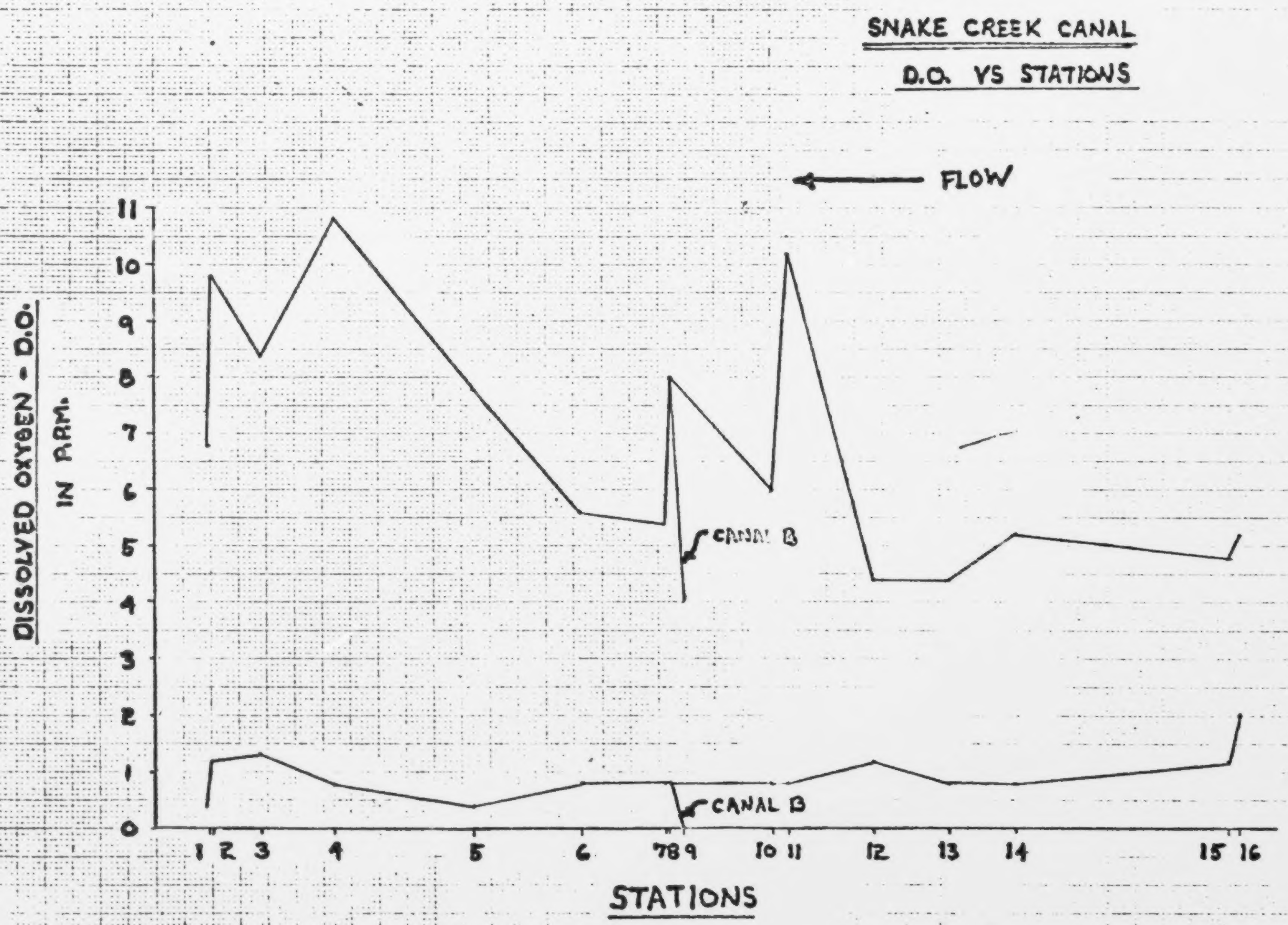
Dissolved Oxygen

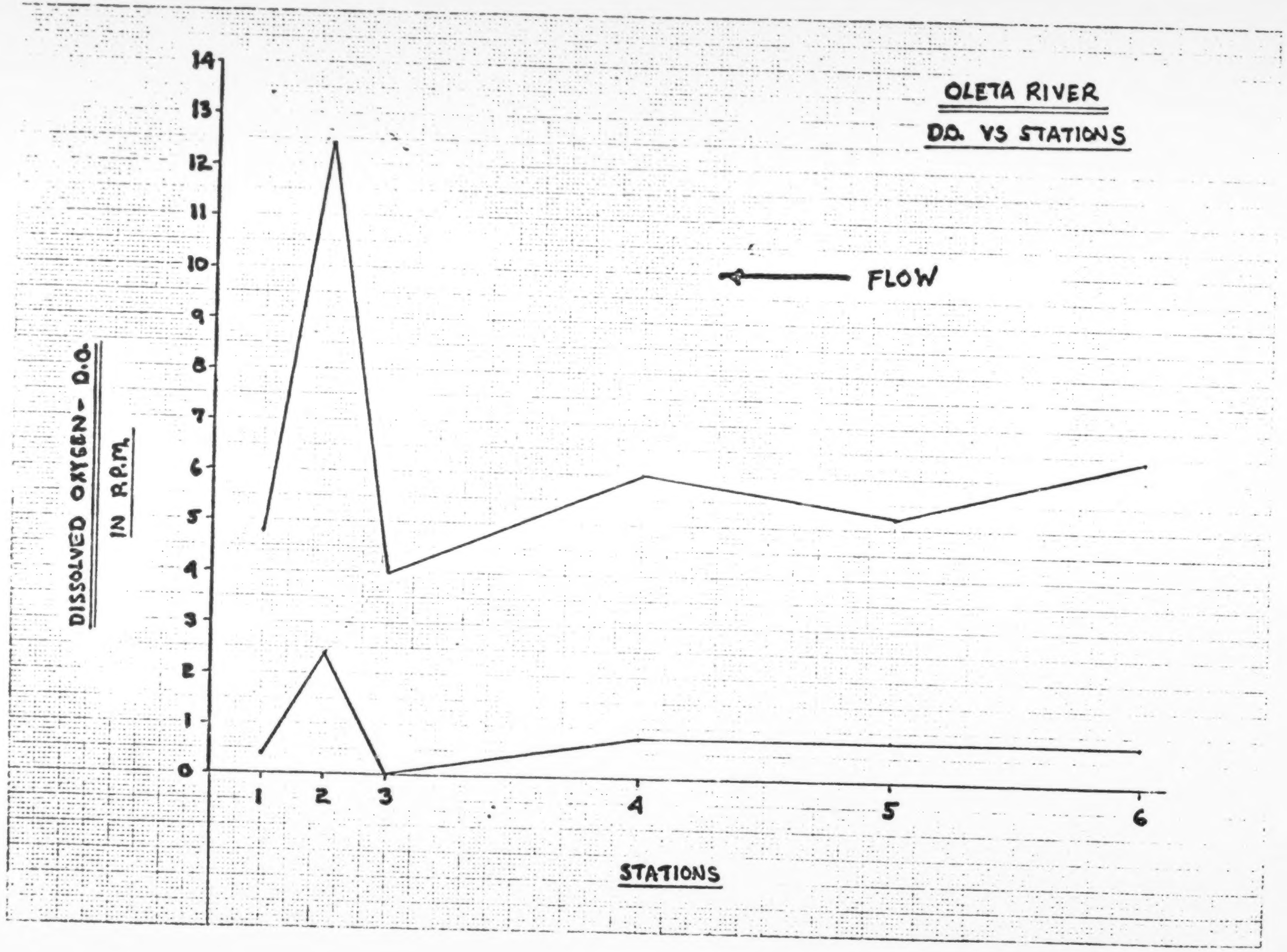
Dade County Pollution Control Data
December 1967 to December 1969

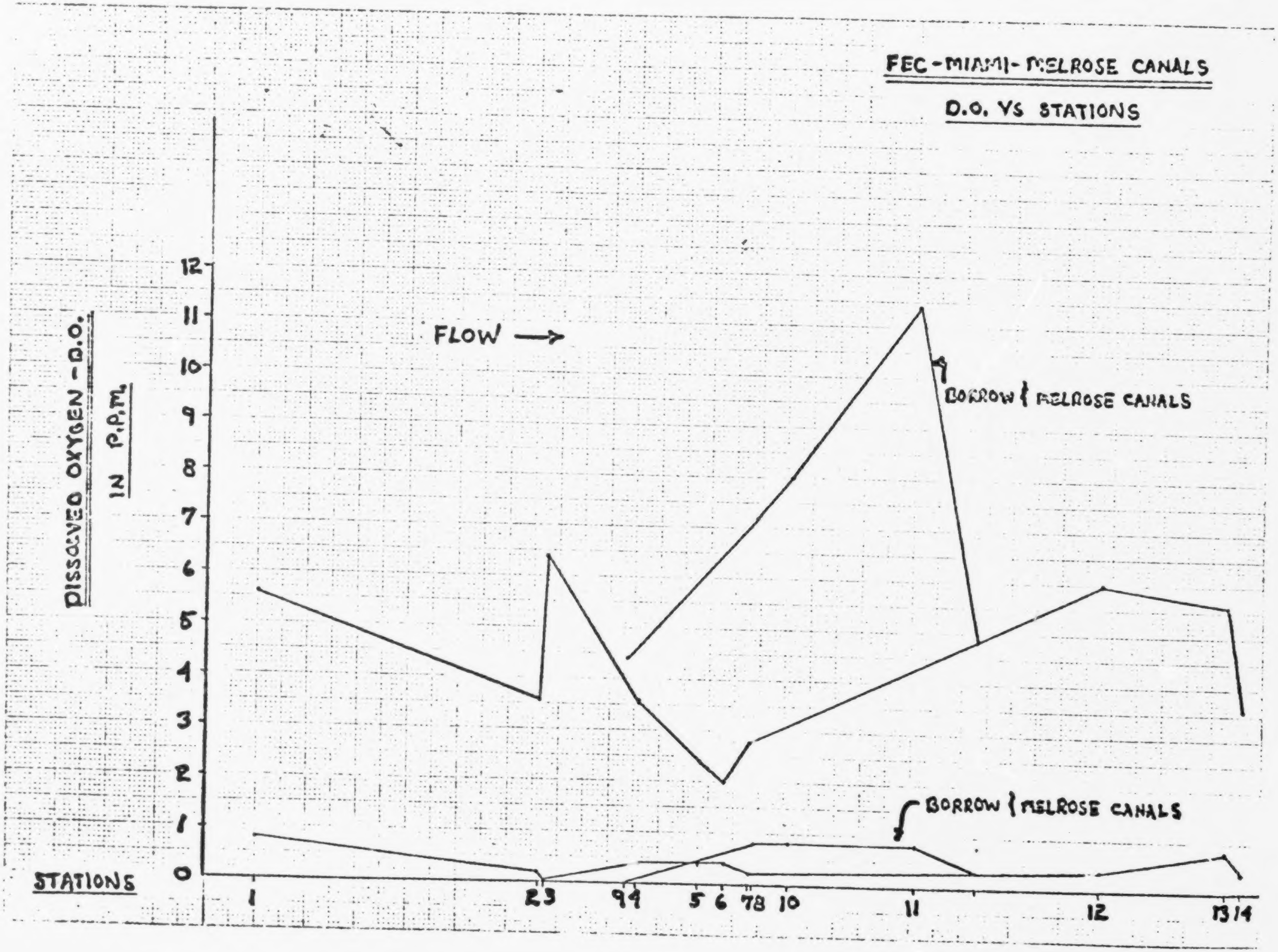
Graphs of Minimum and Maximum D.O. Values

vs

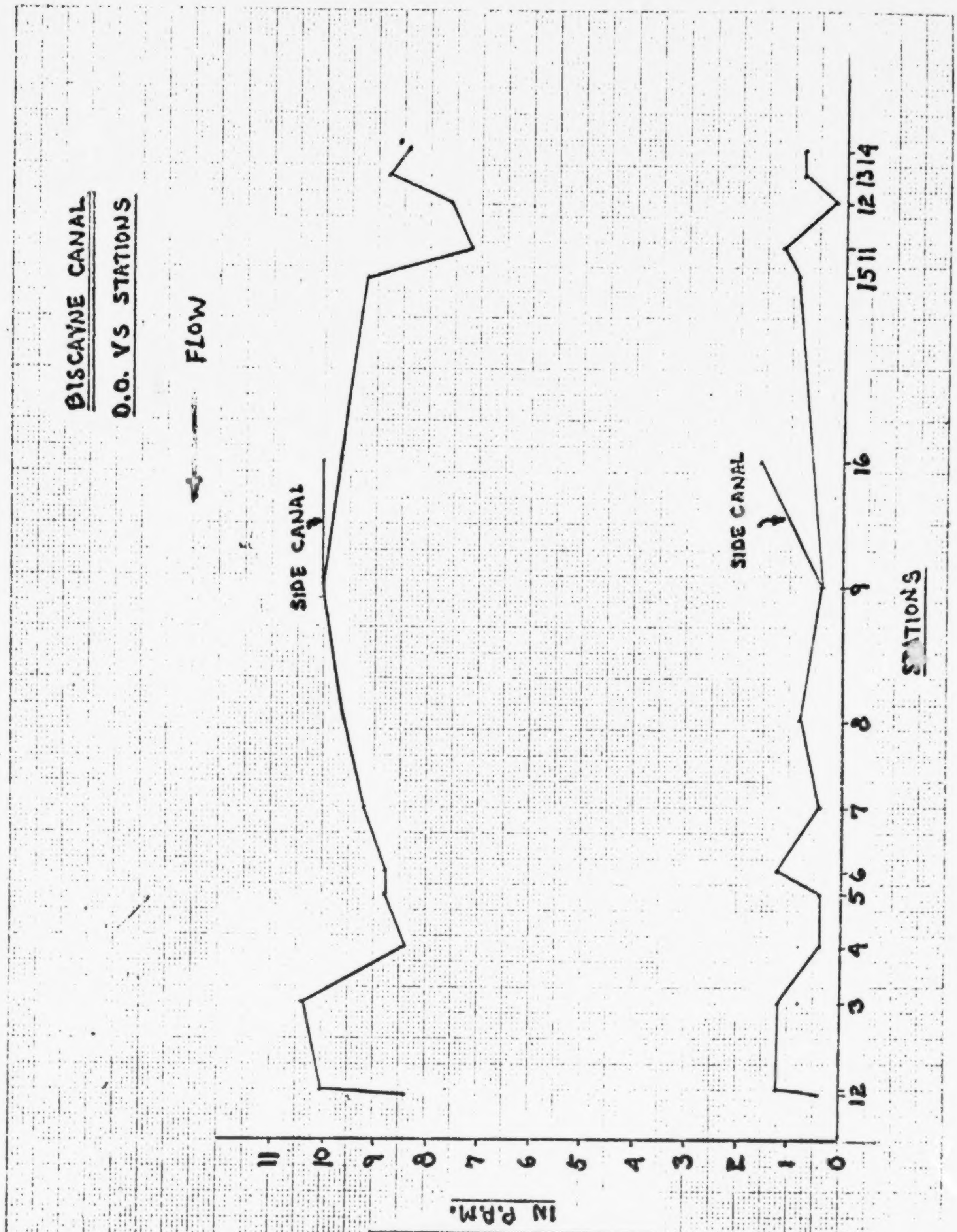
Stations

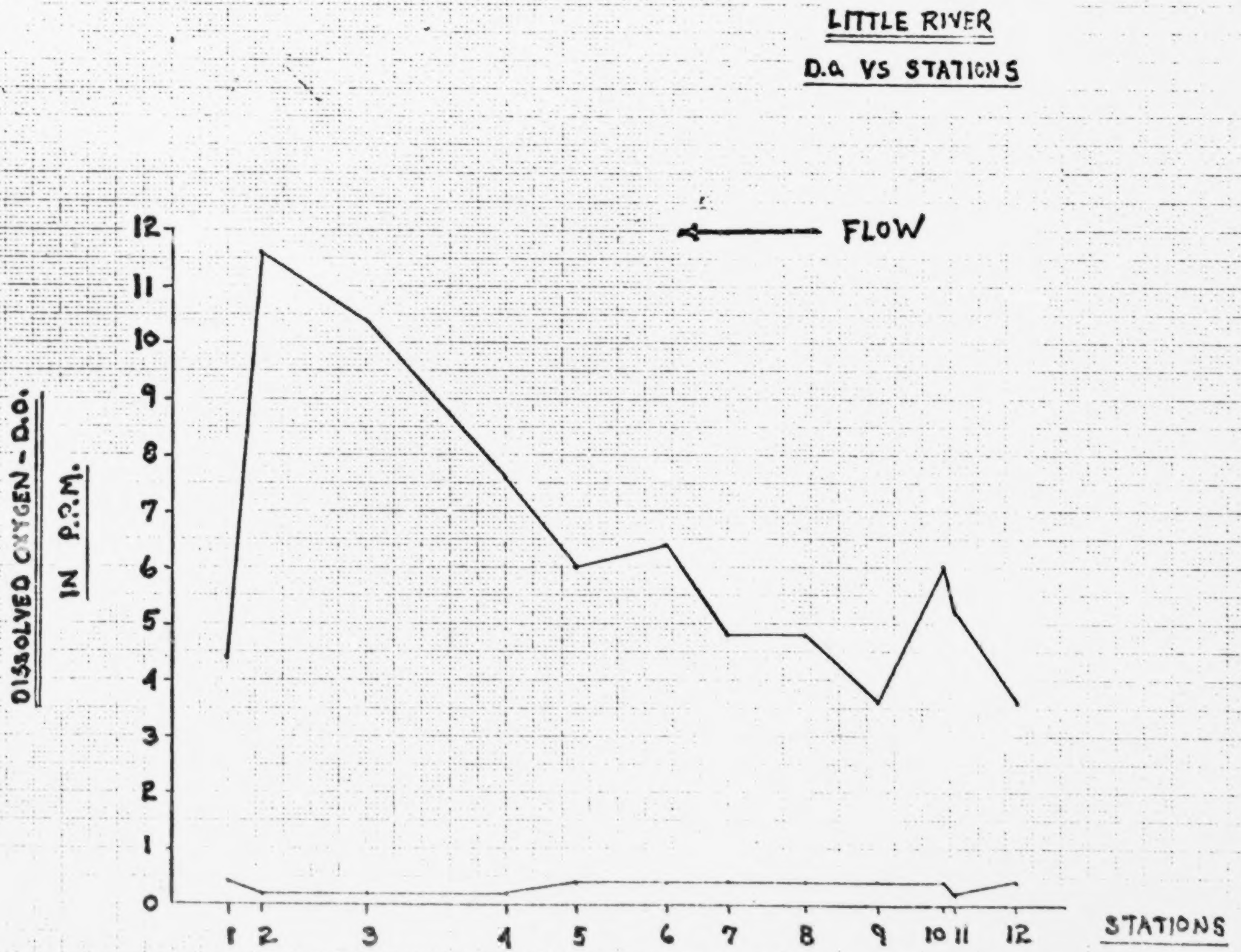

SNAKE CREEK CANAL
D.O. VS STATIONS
FLOW
DISSOLVED OXYGEN - D.O. IN P.P.M.
0
1
2
3
4
5
6
7
8
9
10
11
CANAL B
CANAL B
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
STATIONS


OLETA RIVER
D.O. VS STATIONS
FLOW
DISSOLVED OXYGEN - D.O.
IN P.P.M.
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
1
2
3
4
5
6
STATIONS


FEC-MIAMI-MELROSE CANALS

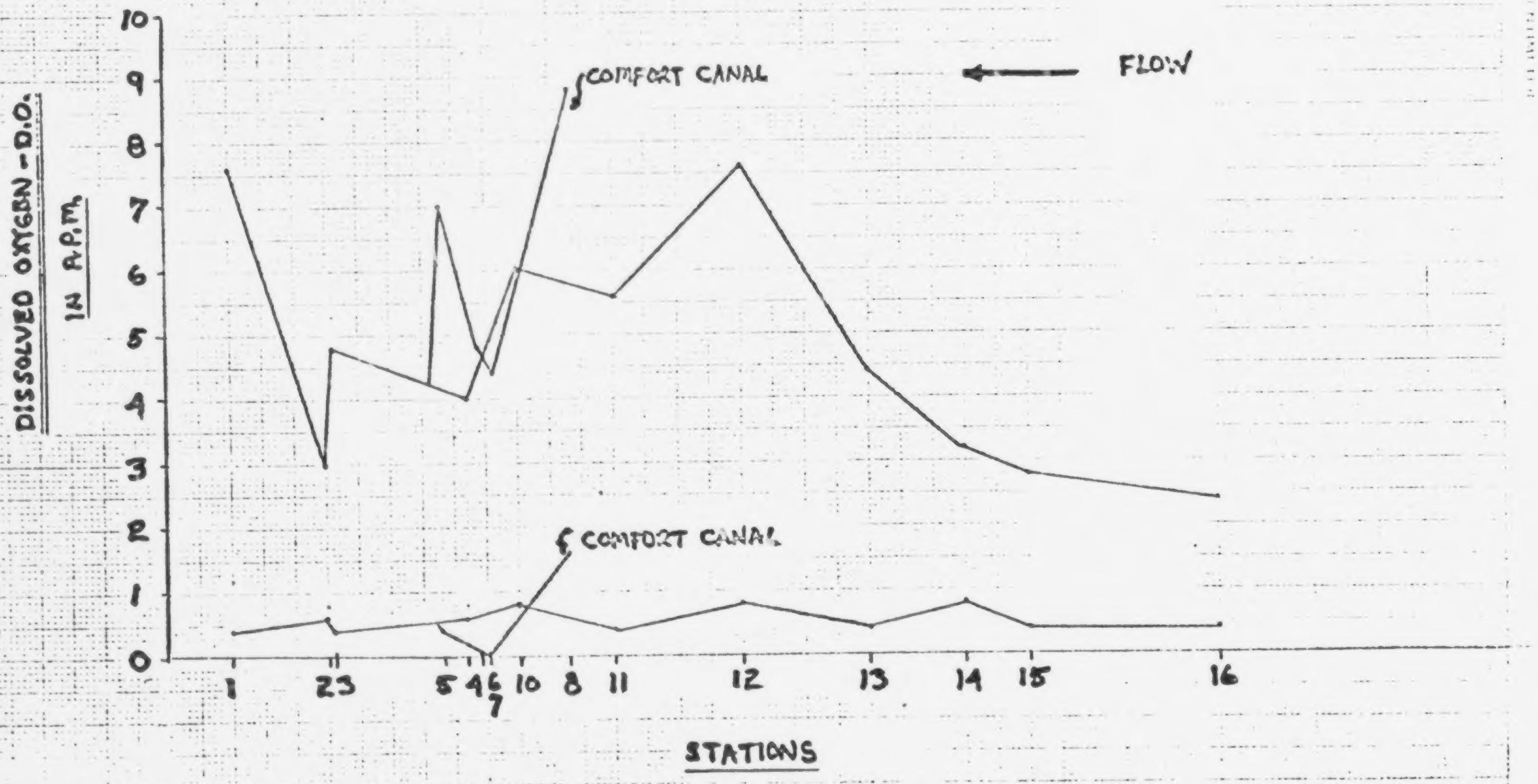
D.O. VS STATIONS

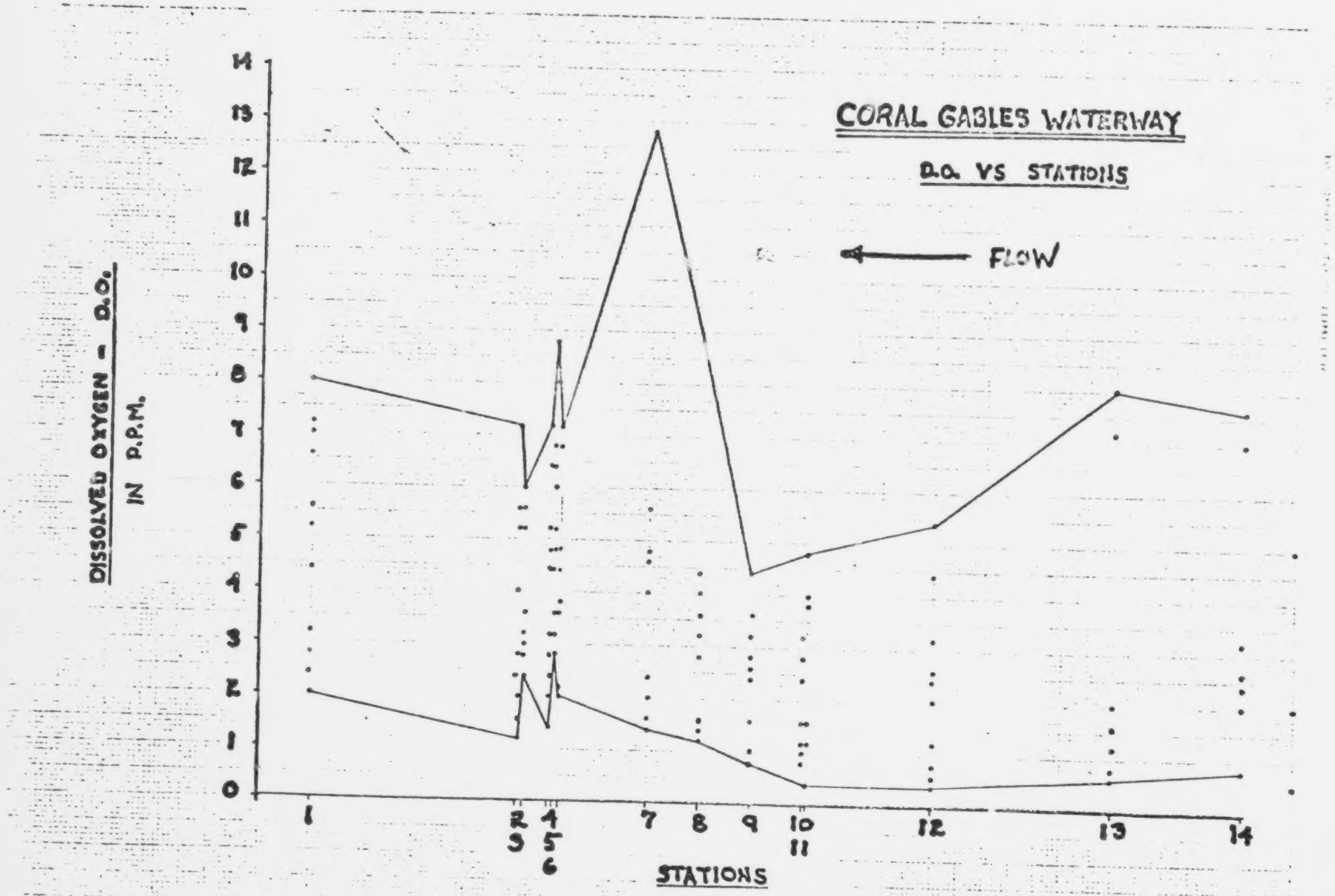

BISCAYNE CANAL
D.O. VS STATIONS
FLOW
SIDE CANAL
SIDE CANAL
DISSOLVED OXYGEN - D.O.
IN P.P.M.
0
1
2
3
4
5
6
7
8
9
10
11
12
3
4
5 6
7
8
9
16
15 11
12 13 14
STATIONS


LITTLE RIVER
D.O VS STATIONS
FLOW
DISSOLVED OXYGEN - D.O.
IN P.P.M.
12
11
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
8
9
10
11
12
STATIONS

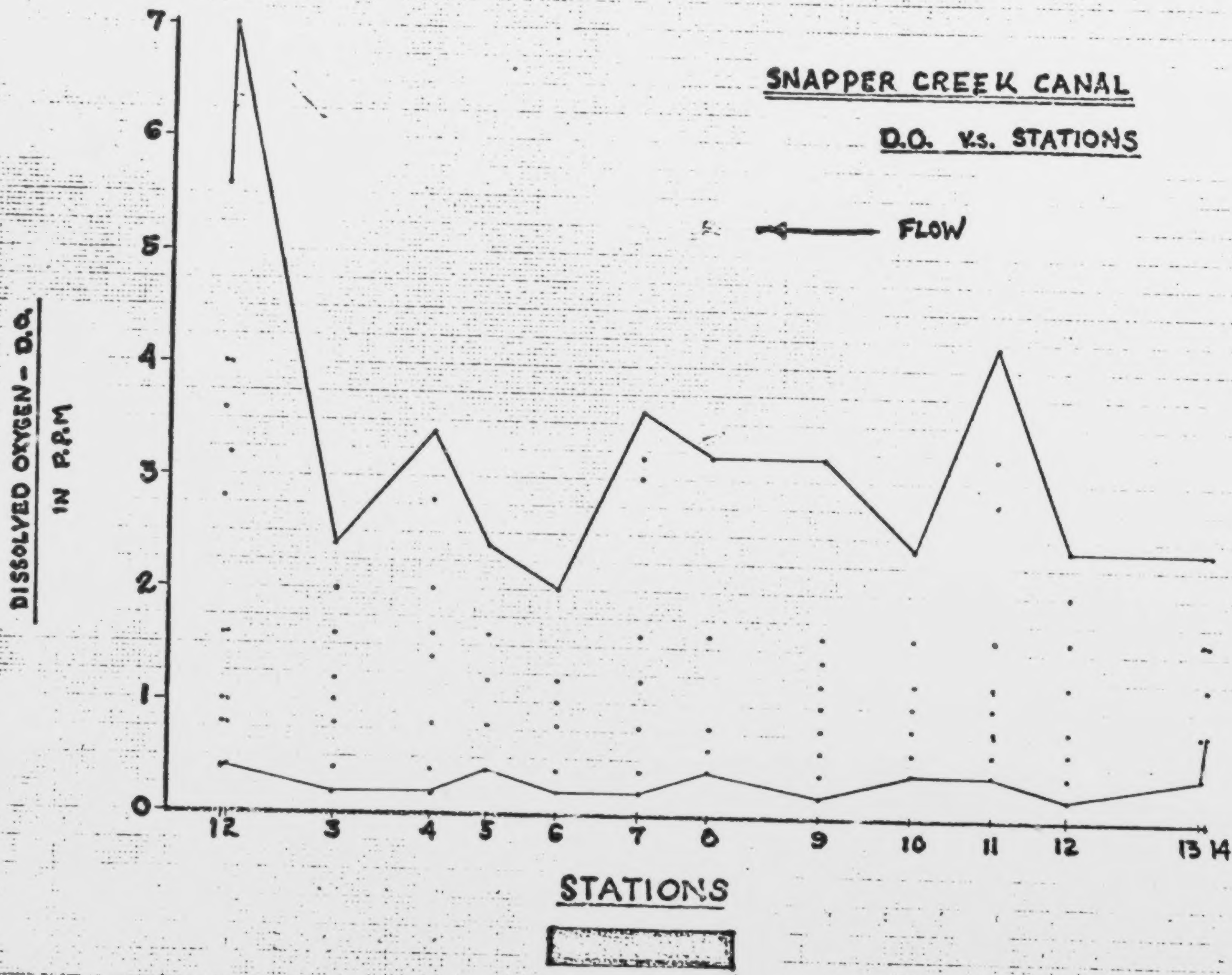
MIAMI-TAMIAMI-COMFORT CANALS

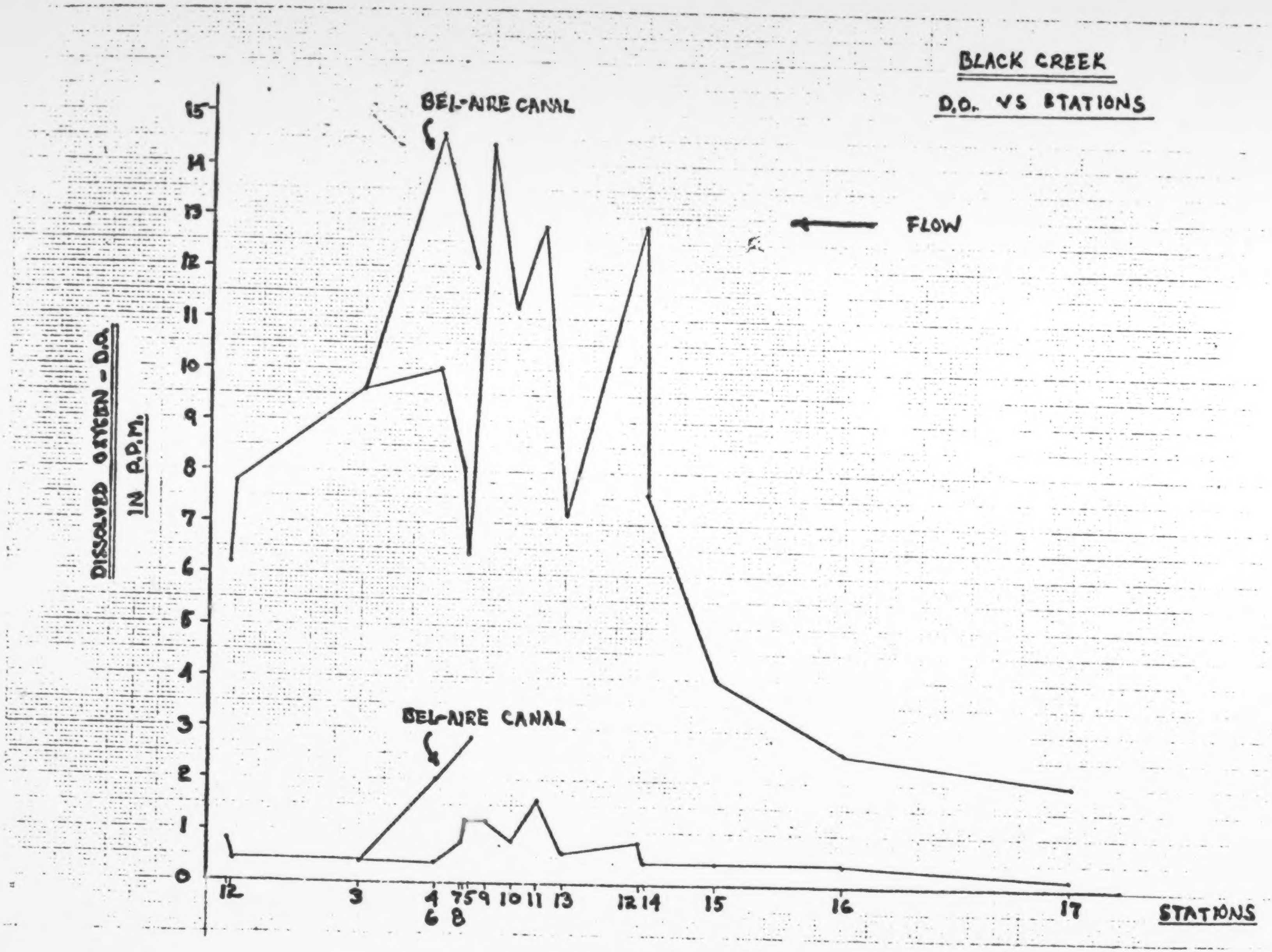
D.O. VS STATIONS




CORAL GABLES WATERWAY
D.O. VS STATIONS
FLOW
DISSOLVED OXYGEN - D.O. IN P.P.M.
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
1
2
3
4
5
6
7
8
9
10
11
12
13
14
STATIONS

[redacted]


SNAPPER CREEK CANAL
D.O. V.S. STATIONS
FLOW
DISSOLVED OXYGEN - D.O. IN P.P.M
7
6
5
4
3
2
1
0
1 2
3
4
5
6
7
8
9
10
11
12
13 14
STATIONS


BLACK CREEK
D.O. VS STATIONS
FLOW
BEL-AIRE CANAL
BEL-AIRE CANAL
DISSOLVED OXYGEN - D.O.
IN P.P.M.
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
12
3
4
6
7
5
8
9
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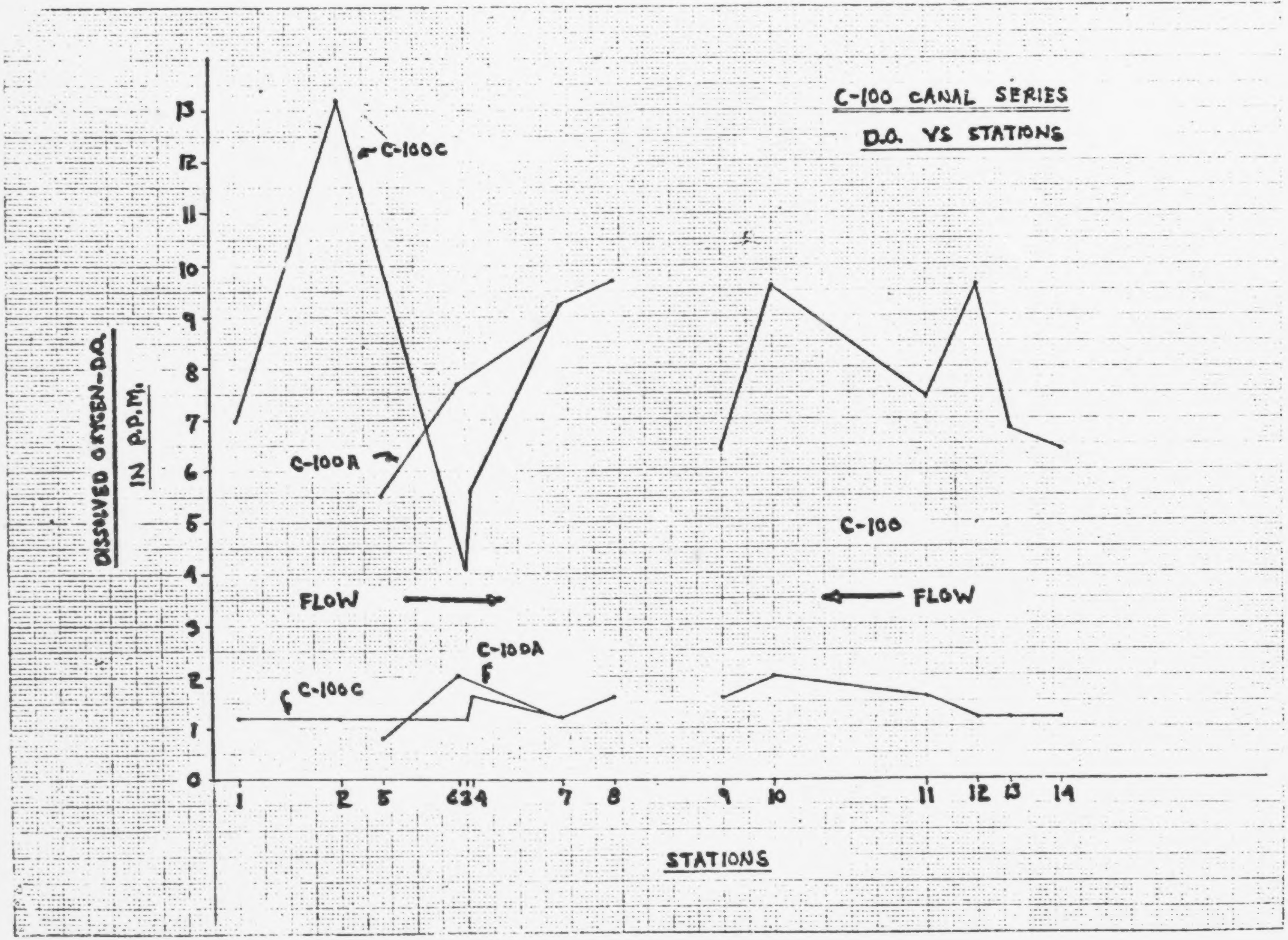
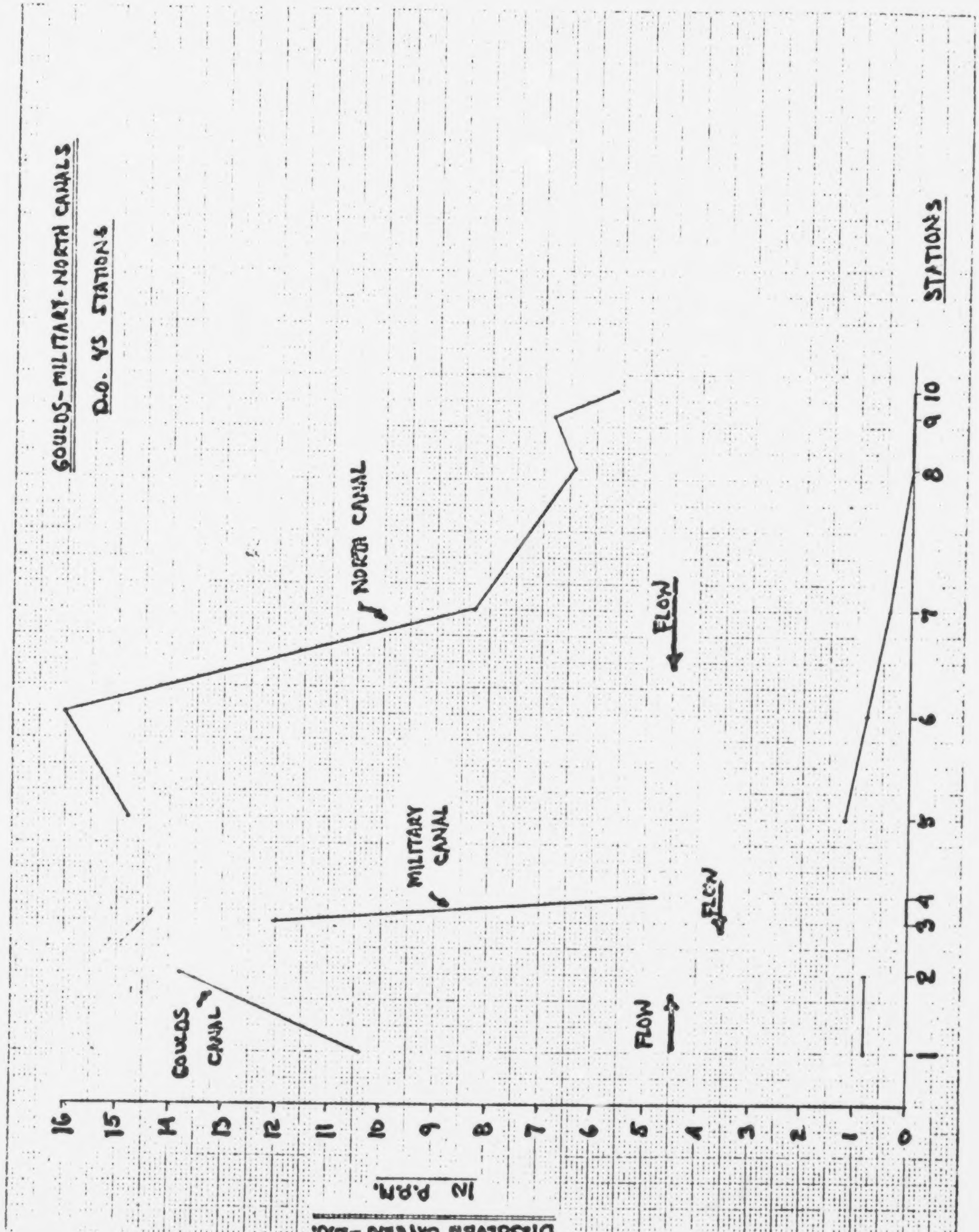
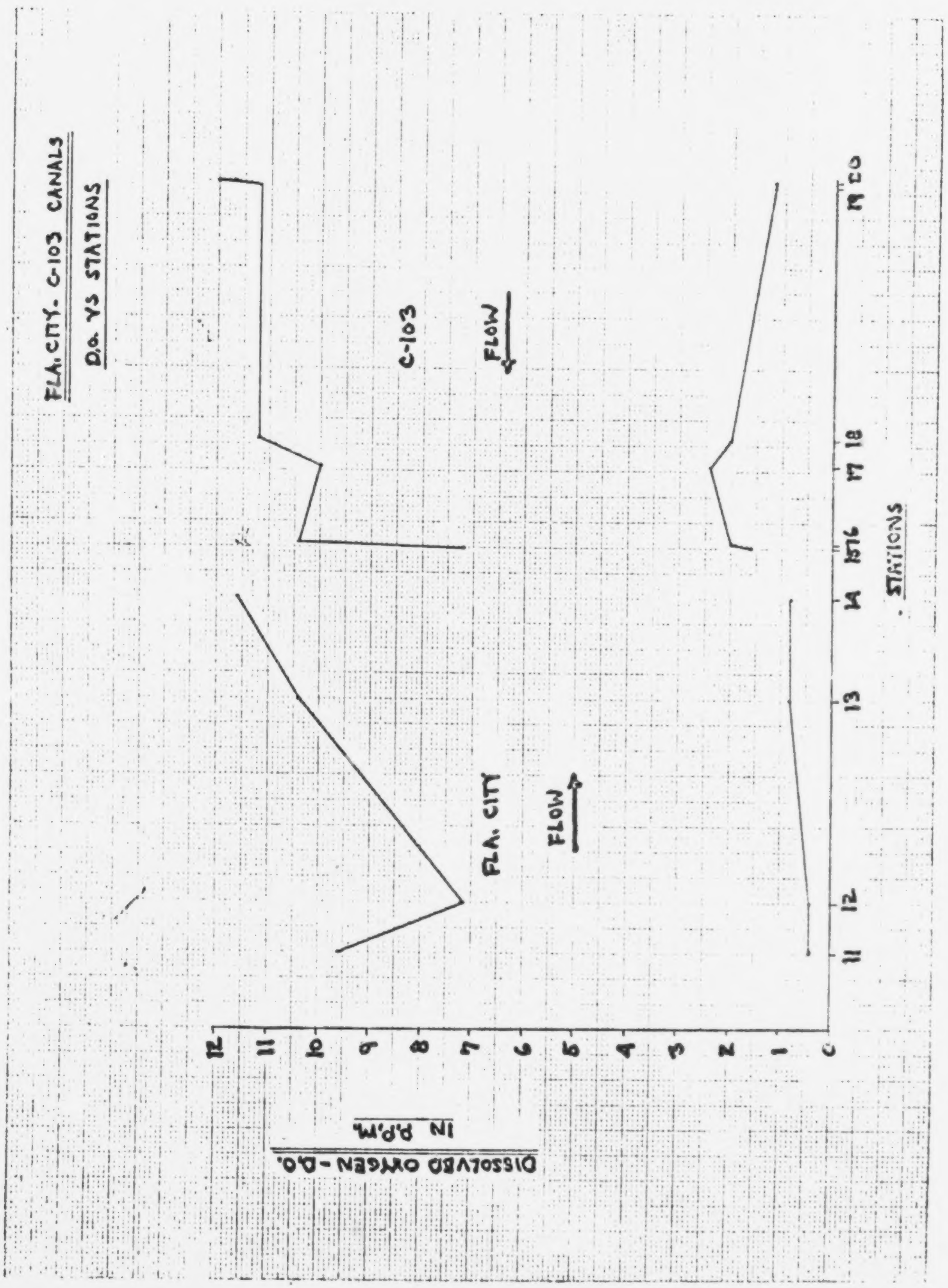
11
13
12
14
15
16
17
STATIONS


C-100 CANAL SERIES
D.O. VS STATIONS
DISSOLVED OXYGEN-D.O. IN P.P.M.
13
12
11
10
9
8
7
6
5
4
3
2
1
0
C-100C
C-100A
C-100
FLOW
FLOW
C-100A
C-100C
1
2
5
6
3
4
7
8
9
10
11
12
13
14
STATIONS


GOULDS-MILITARY-NORTH CANALS
D.O. VS STATIONS
DISSOLVED OXYGEN - D.O.
IN P.P.M.
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
8
9
10
STATIONS
GOULDS CANAL
MILITARY CANAL
NORTH CANAL
FLOW
FLOW
FLOW


FLA. CITY - C-103 CANALS
D.O. VS STATIONS
C-103
FLOW
FLA. CITY
FLOW
DISSOLVED OXYGEN - D.O.
IN P.P.M.
0
1
2
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5
6
7
8
9
10
11
12
11
12
13
14
15 16
17
18
19 20
STATIONS

APPENDIX E

Total Coliform Plate Counts in Samples of 100 ml

North Biscayne Bay - 21 Stations
Mid Biscayne Bay - 26 Stations

NORTH BAY

TOTAL COLIFORM PLATE COUNTS
IN SAMPLES OF 100 ML
(Approx. 3 oz.)

STATION NUMBER	AREA	3/4/70	3/7/70	3/10/70
1	Pelican Harbour Yacht Club off North Bay Causeway	20	0	120
2	North Bay Village adjacent to WIOD & WCKT	100	80	60
3	Indian Creek at Normandy Drive (Hwy 828)	240	560	120
3A	Biscayne Bay - Normandy Isle North Shore Dr. at Shore lane	---	40	80
4	Miami Beach Atlantic Ocean at 72nd St.	220	20	160
5	Bal Harbour Atlantic Ocean at 96th St.	60	40	0
5A	Surfside Indian Creek at 95th St.	---	40	900
6	Haulover Beach north of Fishing Pier	0	0	40
7	Bakers Haulover Cut North side	0	0	0
8	Haulover Beach - North of Marina Intracoastal Waterway	40	20	780
9	Sunny Isles Atlantic Ocean at Pier	80	40	1,700
10	Golden Beach Atlantic Ocean & Navona Ave.	160	0	0
11	Golden Beach Dumbfoundling Bay/Terracina Ave.	100*	1,880	>10,000
12	Sunny Isles - Intracoastal Waterway and Sunny Isles Ocean Beach Blvd.	520	>2,000	1,000

* Very high chlorine odor and residual causing attenuation of organisms. Sample from this area on 2/20/70 yielded a plate count of 3,000 E.C. (fecal coliforms), a highly suspicious count.

NORTH BAY

IN SAMPLES OF 100 ML

(Approx. 3 oz.)

TATION JMBER	AREA	3/4/70	3/7/70	3/10/70
13	Little Lake Maule N.E. 171st Street	140	920	1,000
14	Maule Lake N.E. 26th Ave. & Greynolds Park	> 1,000	> 2,000	1,460
15	Oleta River - Greynolds Park at No. Miami Beach Blvd.	240	480	1,000
16	Emerald Lake Emerald Dr. & N.E. 131st St.	160	120	200
17	Little Arch Creek Emerald Dr. & N.E. 131st St.	540	> 2,000	1,500
18	Biscayne Bay at N.E. 123rd Street	40	40	320
19	Biscayne Bay N.E. 105th St. & Biscayne Canal	---	60	> 1,000

TIDES:	High Slack	High Outgoing	Low Slack

Mid Biscayne Bay

Total Coliform Plate Counts in Samples of 100 ml

Station Number	Area	3/19/70	3/26/70	3/31/70	4/25/70
1	Lake Sabal (Island Rd.)	400	5,000	200	100
2	Julia Tuttle Causeway and Intercoastal W-way	0	700	200	60
3	Julia Tuttle Causeway and Miami Beach	20	20	80	--
4	Arthur Godfrey Road and Biscayne W-way	40	1,000	240	40
5	Surprise Lake	100	5,000	200	140
6	Arthur Godfrey Road and Indian Creek	180	10,000	6,000	1,040
7	41 Street and Miami Beach	0	0	0	--
8	Lake Pancoast and 25 Street	160	30,000	8,000	3,000
9	25 Street and Miami Beach	0	60	20	400
10	14 Lane and Miami Beach	400	0	60	40
11	Miami Beach Municipal Pier	0	0	0	--
12	Dock Park and Government Cut	0	4,600	80	20
13	Causeway Isle (North side)	0	20	0	--
14	Watson Park (North side)	0	480	140	--
15	Government Cut Chalks	240	10,000	1,020	300
16	Venetian Causeway (Miami side)	180	20,000	1,620	180

Station Number	Area	3/19/70	3/26/70	3/31/70	4/25/70
17	Bayfront Park and Second Street	1,000$^+$	20,000	6,000	2,000
17A	Dodge Island (South West end)	--	20,000	1,060	90
18	Biscayne Bay and 8 Street S. E.	1,400	10,000	320	2,000
19	Rickenbacker Causeway (South side)	0	40	80	0
20	Rickenbacker Causeway (South side)	0	0	0	120
21	Across Platform at Key Biscayne	0	0	0	0
22	Crandon Park Beach	0	100	20	0
23	Bear Cut	0	120	0	0
24	Virginia Beach	1,000$^+$	20	0	0
25	Rickenbacker Causeway (North side)	1,000$^+$	80	420	480

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(2) Jackivicz, T.P., "Pollution of Canals by Septic Tanks", Master's Thesis, University of Miami, June, 1969.

(3) Leach, Paul, "Reply to Grand Jury on Pollution". September 1970.

(4) Schang, K. W., "Location and Identification of Sludge Banks Attributable to Sewage Treatment Plants", Master's Thesis, University of Miami (to be released).

(5) ..., Dade County Pollution Control Data, (December 1967 to December 1969).

(6) Morrissey, Colin, report to the Hoover Environmental Defense Fund on Pollution in Biscayne Bay.

MR. STEIN: Thank you.

Why don't you wait there, Professor Fogarty. I don't think they are getting the impact of this. Let me see if I can just pick one of these out.

Total coliforms you have, 1,000 is the upper allowable, right?

DR. FOGARTY: Anything over 1,000 the water is not fit, according to the standards, for swimming. Anything above 1 the water is not fit for drinking.

MR. STEIN: Right. So we have 1,000. Without reading the name, let me read you some of the figures, I don't think I am going to skip any, that he put down for total coliforms. Remember the upper limit is 1,000.

Four hundred thousand, in excess of two hundred thousand, four thousand, one million, six thousand five hundred, one hundred thousand, twenty thousand, three million, one million, fifty thousand, five hundred thousand, five million, three million.

DR. FOGARTY: One additional point, that when the revision of the Dade County ordinance finally goes into effect, the limitation on fecal organisms from sewage treatment plants is set by law at zero.

MR. STEIN: Are there any other comments or questions?

MR. THOMAN: We had a horror story this morning and Dr. Fogarty gave us another horror story. You didn't have to repeat it, Mr. Stein.

Mr. Reed, may I ask a question here?

MR. REED: Go to it.

MR. THOMAN: The statement that I made this morning at the beginning of my remarks was rather deliberate in the fact that I noted that the conference was between the State government and the Federal Government, that the Federal Government looked to the State government solely for its compliance with or working with the Federal law, even though I noted that the Florida State law permitted a local program to exist. Am I wholly out of order here in suggesting that maybe the State ought to take a look as to whether or not Dade County should continue to have jurisdiction over pollution control? There certainly must be some kind of relief from this sort of thing.

MR. REED: Yes, Mr. Thoman, you have touched on a delicate spot. There is relief. The Department is authorized to hold a hearing to see if the local program is acceptable and meets the standards of the State local program provisions. Obviously if the State held that hearing today we would have to rule that the local program was inadequate and did not satisfy the need of the act or the rule or of the community which it was destined to serve.

The criticism I will accept personally. For the two years that I have been involved with the Department I have attempted to assist the local program in Dade County and have hoped and have prayed that it would succeed. When I was on the Pollution Control Commission, the old board, I made the recommendation and the resolution to the rest of the members that was granted that we give to the local pollution control agency here in Dade County, recognizing it had problems with the local court system, the extraordinary powers of making them deputies of our Department so that with the Attorney General's office they could go directly into State court and bypass the municipal court.

After two years and not one case had ever been made with the assistance of the Attorney General's office, represented by Mr. Anderson here today who has been available, has been interested, has been terribly concerned, I saw fit to make a resolution taking that authority away, which I have been sharply criticized for in the Miami press.

MR. STEIN: Are there any other comments or questions?

MR. REED: I can only say to you, Mr. Stein, that we would have to consider this at the end of the conference, obviously.

MR. STEIN: All right.

Well, it seems to me from these figures, if they are at all correct, and we have no reason to doubt Dr. Fogarty, that some of these plants just weren't operating at all.

DR. FOGARTY: These are only grab samples. (Laughter.)

MR. STEIN: That is right. Oh, I am glad you brought that up again. You know, I am making a proposal, and maybe you will want to adopt it down here. You know, if you push something hard enough, people will complain. You complain about the grab samples. I am pushing this as a requirement on the Federal level and pushing it rather hard. Let me tell you. I guess people don't like the grab samples that you people are taking, but you can never take enough.

What I am suggesting is that anyone who gets a permit, Federal, State, local, a grant, or a permit from the Corps of Engineers, be required themselves to take 24-hour sampling of their wastes. These wastes are to be sampled for the amount of flow, the quantity of wastes they put out and the strength of the wastes, either to be done by an independent laboratory or to set up a little black box which is accessible to the regulatory people from the State, the locality, and the Federal Government.

Now, this isn't so unusual. When you buy gas or electricity or water you have to pay for your metering device and what you take. I believe the time has come when the crying against grab samples and the efforts of people like Professor Fogarty have come to the end of their course. If that is what you won't accept, then I think the alternative--and I see this very clearly--is to put the economic burden on the discharger to pay for a continuous sampling of what comes out. Let these people point out what they are putting out every day. That may be the one thing that will be our tool to get at least adequate treatment of facilities.

MR. REED: I agree.

MR. STEIN: Now, you know what we have here? If what you say is true--and I just place a prima facie case--this is in a sense an absolute fraud. Here we have devices that someone has paid a lot of good money for that are supposed to be in and doing a job. Obviously they are not operating and are just not doing the job. Anyone who thinks he has pollution control by just running raw wastes into a sewage treatment facility and running it out just the way he puts it in is not only kidding the public but I think, in this day and age, is doing us all a very severe disservice. I know a lot of people run good plants and the difficulty is that you all get tarred with the same brush.

DR. FOGARTY: If I could, one last thing, I will make an offer here, it is about a 5-minute tour. I know we couldn't get everybody in the bus to go out in Dade County, but we did take some pictures Saturday and we have just about five minutes of slides, if you all would be interested in seeing them.

MR. STEIN: Yes, go ahead.

MR. REED: We will go off the record while we see the slides.

MR. FOGARTY: All right, fine.

I will ask one of our graduate students, Mr. Morrissey, to comment on them.

MR. MORRISSEY: My name is Colin Morrissey. I am a graduate student at the University of Miami. This is a series of slides that we have taken over the past several months with the latter half of them being taken Saturday afternoon on a tour of some of the local treatment plants that we went to.

(Off the record.)

MR. STEIN: We will recess for five minutes.

(RECESS)

MR. STEIN: Let's reconvene, please.

For the benefit of those who are staying with us, we intend to run to about 5 o'clock. When I say about, we are not going to cut anyone off in the middle of full flight.

Mr. Reed.

MR. REED: Mr. Stein, I have as our next witness Mr. Harvey Ruvin, the former Mayor of North Bay Village, Miami Beach, Florida.

Mayor.

HARVEY RUVIN

FORMER MAYOR, NORTH BAY VILLAGE

MIAMI BEACH, FLORIDA

MR. STEIN: Do you have a copy for the reporter?

MR. RUVIN: Yes. Mr. Stein, I have circulated copies of this package, I believe, to everybody on the dais as well as to members of the press.

I personally want to thank you for this opportunity to appear before you today. I have listened and heard some of the people that have spoken before and I think that one thing that comes out of this is that there is going to be an increased awareness and that if exposure is given to some of the facts that have been presented that alone will do tremendous good.

I think one of the speakers before me, Dr. Vernon, said that we seem to have a lot of people concerned and not enough people informed. I think that that is worth dwelling on for a couple of seconds, because obviously in the last year and a half or the last two years there has been a growing awareness to what Mr. Stein called the age of suicidal treatment of the environment. I think a lot of it has to do with a little particle of earth matter that we sent up to the moon and sent man up there along with a TV camera that showed us live what earth is and that all of a sudden now it is beginning to fall into the consciousness of man that we are nothing more than a little space particle. You can tell somebody today that there is less air in relation to the size of the planet earth than there is skin on an apple and he won't look at you like you are crazy any more.

And obviously everything, including air, is finite and the comments of Dr. Vernon about recycling I think are the most meaningful that I have heard, because if everything is finite, the next and the only conclusion that you can reach is that we must recycle and the name of the game is going to have to become planning, dealing with all types of population, transportation and land use questions. It is going to have to beg those questions.

I think that we need something on a Federal level that is going to be able to back up State agencies that can be created either with cabinet level authorities or as high as possible decisional powers possible to start planning, to start taking every piece of precious earth and giving it a purpose and building master land use structure and plan so that we can beg all these problems.

But when you get right down to it, you talk philosophy and you talk about the fact that Albert Schweitzer, who was a pretty good judge of character,said,"We don't have the ability to foresee and to forestall." We have got to remake that phrase. It can't possibly be true or we won't survive.

But when we get apart from all of the philosophy of it, it really boils down to what kind of a commitment we are going to make in dealing with each individual case and source and type of pollution. The main purpose for my coming here today was to talk about one particular source, not the major source, not even a final source, but it is an important source because I think it is one that we can establish a commitment on and follow through with.

In Dade County, when we put aside the ocean and a lot of the canal waterways, the most important water consideration is obviously Biscayne Bay. This has become a vast sewer. Many types of pollution are continually being ejected into it. Over a year ago when Dr. Fogarty took his samples for the Hoover Commission,at that time they found that the northern part of the bay was so bad that it was a foregone conclusion. The southern part of the bay with 28 samplings showed a shocking pollution, a shocking content, coliform content and nutrient content.

Now, part of this problem in our area comes from pleasure boats, and I will divide that into two areas, live aboard and non-live aboard. I am talking about live aboard facilities.

I was the Mayor of a community by the name of North Bay Village. We are not part of Miami Beach now, we are a separate city; that is perfectly all right. We are a very unique city because we are completely manmade, three manmade islands that lie pretty much smack dab in the middle of Biscayne Bay. Our particular situation is that north of us the water flows north and out Baker's Haulover, south of us it flows south out of Government Cut, so we are in a fairly stagnant area.

As small as we are, we have five miles of shoreline, because of our shape, and we found that we had over 300 people living on houseboats. Mr. Stein, there were no ducks to be diapered in Biscayne Bay, and we found some pretty horrible situations. It was visual sightings of fecal matter, we found a great rate of algal growth in and around the shore area.

We took extensive hearings on what present technology has to offer with regard to treatment from heads on marine toilets and just what is being done and what do they have that can do any kind of a job. We found that they were all chance--that the so-called macerator chlorinator, which does nothing more than swish it up so that we don't see it, is what it is, but it still is what it is, and then injects a little chlorine into it. It may deactivate the bacteria at the point of discharge, but it is like wine, the bacteria will stop after a certain percentage of alcohol. You start pouring more water in it and it goes again. Well, that is the process when sewage is put in the bay. The bacteria in the bay activate it and we have got a tremendous problem, a health problem.

And we tried to avoid the conclusion that there was no way to do it but to flat out ban discharge, but we finally had to come to that conclusion. We passed an ordinance, which is the first part of this package. The first part of this package is an ordinance that was passed in late December of 1969 in North Bay Village which did essentially two things. It is a rather voluminous ordinance due to the many aspects of marinas and docking, but the parts of it that are significant to our discussion are:

Number 1, we flat out banned discharge from these boats. Instead of just saying you can't live aboard them, we just flat out banned discharge, the only alternative at this

ORDINANCE NO 219

A BOATS. DOCKS, WATERWAYS AND MARINAS ORDINANCE ADOPTING PORTIONS OF THE FLORIDA BOAT REGISTRATION AND SAFETY LAW. PROVIDING ADDITIONAL DEFINITIONS, REGULATING PRIVATE DOCKS PROVIDING RESTRICTIONS ON DOCKS, PIERS DOLPHINS WHARFS, PILINGS OR STRUCTURES OF ANY KIND REQUIRING REGISTRATION OF BOATS WITH CITY MANAGER RESTRICTING THE OPERATION OF AIRCRAFT, PROHIBITING BUSINESS OPERATIONS ON BOATS EXCEPT IN CERTAIN ZONED AREAS REGULATING MARINAS, REGULATING HOUSEBOATS, PROVIDING SANITATION AND POLLUTION CONTROL OF WATERS WITHIN THE CORPORATE LIMITS OF THE VILLAGE REPEALING ALL CONFLICTING ORDINANCES PROVIDING PENALTIES THEREFORE AND PROVIDING A SEVERABILITY CLAUSE AND AN EFFECTIVE DATE

BE IT ORDAINED BY THE VILLAGE COUNCIL OF NORTH BAY VILLAGE FLORIDA:

SECTION 1 The provisions of the FLORIDA BOAT REGISTRATION AND SAFETY LAW, Part 1, of Chapter 371 of the Florida Statutes, including the definitions contained in Florida Statute 371 021, are hereby adopted by reference and incorporated into this Ordinance

SECTION 2 "DEFINITIONS" In addition to the definitions contained in Section 371 021 of the Florida Statutes, the words and phrases herein defined shall be construed in accordance with the definition set forth therein, unless it is apparent from the context that a different meaning is intended.

(A) The terms "dolphin" and "mooring" mean any appliance used to secure a boat or other vessel, other than to a pier, which is not carried aboard such boat or vessel as regular equipment when underway

(B) "Dock" shall mean any fixed or floating structure for securing boats, loading or unloading persons or property, or providing access to the water, and includes the terms "pier", "wharf", "float" or any other landing facility

(C) "Waters of North Bay Village" shall mean all waters within the corporate limits of the City of North Bay Village, whether immediately tangent to one of the islands or a part of Biscayne Bay

(D) "Marinas" shall mean any area within North Bay Village, where one or more sites or locations are rented or offered for rent for the location or dockage of boats, vessels or houseboats on land or in water, or to be used for living quarters either permanently or on a temporary basis

(E) "Riparian Right-of-Way" shall refer to the water immediately adjacent to any real property located within the Village limits of North Bay Village as defined in Florida Statute 271 09.

(F) "Utility Hook-up" is any connection between the waterfront property or docks and piers appurtenant thereto located within the riparian right-of-way and any boat, vessel or houseboat provided to conduct water, electricity, telephone service, gas or other utility, or sewerage to or from said boat, vessel or houseboat.

(G) "Houseboat" or "Floating Home" means any vessel in fact used or designed primarily to be occupied as living quarters and for any business or occupation whatsoever, or for any private or social club of whatsoever nature, including the use thereof for the entertainment or recreation of guests or tenants while same is moored or docked within the corporate limits of North Bay Village; whether such vessel is self-propelled or not."

(H) "Docking Site" means any "slip", "berth", or space to accommodate a single boat, vessel or houseboat.

SECTION 3. Regulation of Private Dock: No person, firm or corporation shall be permitted to lease or use any boat, vessel or houseboat for living quarters, or to otherwise occupy same, on a permanent basis in area of North Bay Village zoned R1, R1a and R2. Owners of private docks in such zoned areas shall be permitted "Utility hook-ups" to one boat from any dock which may be erected upon the riparian right-of-way abutting their property.

The renting of such docks or dock bases, and the rental of boats or any portion thereof, for any purpose whatsoever, shall be specifically prohibited in areas of North Bay Village zoned R1, R1a and R2 and, further, residing on boats within the city limits of North Bay Village is prohibited, except where such docks constitute a part of a marina, a yacht club, hotel or motel.

SECTION 4. Restrictions on Docks, Piers, Dolphins, Wharfs, Pilings or Other Structures:

(A) No person, firm or corporation shall construct, reconstruct or repair any docks, piers, dolphins, wharfs, pilings or similar structures of any kind more than twenty-five (25) feet perpendicular from the seawall or shoreline into any waterway within the corporate limits of North Bay Village

(B) Plans and specifications for construction, reconstruction or repair of such docks, piers, dolphins, wharfs, pilings or similar structures shall comply with all provisions of the Code of North Bay Village, and shall be approved by the City Manager and the City Building Official, and shall be kept permanently in the records of the City. Repair or reconstruction may be made in accordance with the original plans.

(C) No dock, pier, wharf, dolphin, piling or similar structure shall be erected in North Bay Village unless the said structure is set back at least seven and one-half (7-1/2) feet from the lot line on each side; and the said structure shall not exceed five (5) feet above ground level, except a joint or "party" dock may be permitted on the property line if approved by Council.

(D) No person, firm or corporation shall build, maintain, extend or make any structural alteration on any building, dock, pier, dolphin, wharf, piling, bulkhead, seawall or similar structure in, upon or over the waters adjacent to Harbor Island, Treasure Island, North Bay Island and Cameo Island within the corporate limits of North Bay Village, or do any filling, excavating or dredging in said waters without first obtaining a written permit to do so from the City Manager.

(E) Application for any permit or the transfer of any permit required by this Section shall be made to the City Manager in writing on forms provided therefore. The permit shall constitute an Agreement by the applicant to comply with all conditions imposed upon granting of the permit.

(F) The application shall be accompanied by plans and specifications setting forth in detail the work to be done.

(G) All applications for construction or structural alterations of any building, dock, pier, dolphin, wharf piling, bulkhead, seawall or similar structure in, upon or over the waters within the corporate limits of North Bay Village shall require the approval of the Village Council, and in granting any such application, the Village Council may impose conditions in the permit which it seems necessary to protect the waterways of North Bay Village in accordance with the public safety and the general welfare. The requirement of approval by the Village Council shall not include applications for repair of existing structures.

(H) Nothing contained in this Section shall be construed or apply to prohibiting repair or reconstruction or otherwise limiting those structures which exist at the time of adoption of this ordinance, however, the provisions of sub-sections (d), (e) and (f) shall be complied with.

SECTION 5 Registration of Boats, Vessels and Houseboats: Any boat, vessel or houseboat which remains within the corporate limits of North Bay Village more than twenty-four (24) consecutive hours must be registered with the City Manager, and it shall be the duty of any firm, person or corporation owning, operating or maintaining such marina to maintain accurate records of the address of the owner and operator and to make such records available to the City Manager or his delegate.

Any person, firm or corporation maintaining a boat, vessel or houseboat within the city limits of North Bay Village shall be required to maintain the minimum safety standards provided in the Florida Statutes regardless of whether or not said boat, vessel or houseboat is registered in some other state or country. Failure to provide such records to the City Manager of his representative upon request shall constitute a violation of this ordinance.

SECTION 6. Restriction on Operation of Aircraft: It shall be unlawful for any person, firm or corporation to, in any manner, operate any type of aircraft, including helicopters or lighter than aircraft, upon the waters within the boundaries of North Bay Village Florida. Such operation of aircraft to include the landing upon and taking off from said waters.

SECTION 7. Restrictions Against Business Operation on Boats, Vessels or Houseboats: No firm, person or corporation shall operate any business or proffession upon any boat, vessel or houseboat within the corporate limits of North Bay Village, except in the riparian right-of-way abutting area zone B3 and, then only with the approval of a majority of the members of the Village Council who shall be guided in their determination by whether same is consistent with the health, safety and welfare of North Bay Village. Business operations as referred to in this Section shall include the practice of a profession or similar venture.

SECTION 8. Regulation of Marinas:

(A) No person firm or corporation shall lease, rent or permit the use of docks, piers, wharfs or similar structures within the limits of North Bay Village by another for consideration, unless they possess a valid license to operate a marina pursuant to the provisions of this ordinance. The use of dock space by the tenants or guests of any apartment or hotel as a part of the "unit rent" shall be considered consideration within the meaning of this ordinance.

(B) Classification of Marinas: There shall be two classifications of marinas:

1. "Ancillary." Meaning a secondary operation to the primary function of a hotel, apartment or club which permits the use of dock facilities exclusively to the tenants of such apartment, or the guests of a room or hotel unit, where such boats or vessels, as may be owned by such guests or tenants are not used for either permanent or temporary sleeping or living quarters, but, exclusively for the storage of such boats or vessels while they are not in use.

2. "Business Marinas." Which sall mean the operation of any marina not included in the foregoing definition of "ancillary" operation.

(C) Any "Business Marinas." Which shall mean these licensed by North Bay Village will be required to meet the following minimum specifications:

1. A permanent float, dock or slip for the mooring or docking of each boat, vessel or houseboat from which such vessel may be directly boarded.

2. Each space intended for a boat, vessel or houseboat must be provided with the following: A permanent water supply with an individual antiback flow valve; a sewer connection leading into a permanent sewer; and provide proper pumping and equipment to reach the city sewer line, and a permanent supply of electricity.

3. Each marina shall be required to provide one automobile parking space for each boat berth or docking site.

4. Such other additional conditions which the Village Council might deem necessary to protect the public health welfare and safety of the citizens of North Bay Village and to promote the general welfare.

(D) Fuel Safety Requirements: No marina within the limits of North Bay Village shall be permitted to obtain a license, or renewal of a license, unless the areas where boats, vessels and houseboats are fueled, and, otherwise reprovisioned, are completely separate and apart from the sites for mooring such boats, vessels or houseboats. Any line, pipe or other conduit carrying inflammable fuel or other fluid shall be prohibited from running adjacent to any area used as a site for mooring a boat, vessel or houseboat in said marina, and the Fire Chief of North Bay Village shall be required to examine such facilities and to approve same as being safe before any license shall be issued or renewed.

(E) Approval of Plans: The plans of any marina shall be approved by the Corps of Engineers of the United States Army, the Internal Improvement Board of the State of Florida, the Pollution Control Officer of Metropolitan Dade County, the City Engineer, the City Building Official and City Manager of North Bay Village and the Planning & Zoning Board before said plans are submitted to the Village Council for their approval.

(F) License Fees: The following fees are required for the issuance of a marina license by the City of North Bay Village, Florida, such license shall be required on the first day of October of each year and shall be effective through the 30th day of September of the following year.

1. A fee of $10.00 per year shall be required for each separate utility hook-up.

2. Ancillary marinas as defined in this ordinance shall be charged an annual license fee of $25.00 for each docking site.

3. Business marinas shall be charged an annual license fee of $50.00 for each docking site.

4. Any marina which fails to obtain all necessary licenses on or before the 31st day of December of any year, shall pay a penalty of an additional 10% upon all licenses issued after January 1st of the following year.

5. Docking sites of any condominium or co-operative apartment used exclusively by the owners of such co-operative or condominium apartment shall be exempt from the license fee provision of sub-sections 2, 3, and 4 of this section.

SECTION 9. Pollution Control and Sanitation. No person, firm or corporation shall:

(A) Discharge or permit or allow any other person on a boat, vessel, floating home or houseboat under his control or command to discharge any human or animal excreta from any head, toilet or similar facility on a boat, vessel, floating home or houseboat in the waters of North Bay Village.

(B) Throw, discharge, deposit or leave or cause or permit to be thrown, discharged or deposited or left either from the shore or from any dock, pier, wharf or similar structure or any vessel, or elsewhere any refuse matter of any description into the waters of North Bay Village, or on the shores of North Bay Village, or in the Riparian Right-of-Way, or in such a manner into Biscayne Bay that same may be washed into the Village limits, either by tides or by floods or otherwise.

(C) Place or allow on boats, vessel, floating homes or houseboats, materials, garbage, refuse, timber or waste material of any description nor permit such remain on or upon the shorelines within the City. In the event of the violation of this Section, the City Manager may order same removed with notice unless there appears an imminent danger and the cost, thereof, may be recovered from any person, firm, or corporation, owning said boat or causing it to be placed on the shoreline in a civil action.

(D) Pump or discharge from any vessel or tank into the waters of North Bay Village oil, spirits or any flammable liquid or deposit any roughage, refuse, matter or articles of any offensive character, therein or upon any pier, wharf or dock.

(E) Throw, place or leave any dead animals, or putrid matter, into or in the waters of North Bay Village or along the shoreline within the City.

SECTION 10. Regulation of Houseboats and Floating Homes

(A) No person, firm or corporation shall moor or dock any floating home or houseboat on the waters of North Bay Village, except at a pier, slip, wharf or dock for which a valid current business license issued by the City is in effect licensing the business of a "Business Marina."

(B) No person firm or corporation shall use or occupy or permit the use of or occupancy of a houseboat or floating home for living quarters, either permanently or on a temporary basis, on the waters of North Bay Village, except in a business marina operated pursuant to a permit issued by the Village Council, and unless such houseboat or floating home meets the following requirements:

(1) The houseboat or floating home is designed and maintained so there is a single opening above the waterline for waste and sewerage removal, and such opening is tightly connected to a permanent sewer in a manner approved by the Dade County Pollution Control Officer.

(2) The houseboat or floating home is designed and con structed so that it meets with the requirements of the Building Code, Plumbing Code and Electrical Code to the extent the provisions thereof are applicable, and does not exceed 30 ft. above the water level.

SECTION 11. Hurricane and Storm Regulations. The Village Manager of North Bay Village or such officials as designated by him are authorized, in the event of a hurricane warning or alert, or other danger to the public safety of North Bay Village, in his discretion to order vessels removed from any dock, pier, wharf, or other mooring within the corporate limits of North Bay Village, if, in his opinion, such vessel would constitute a danger to the public safety.

SECTION 12. Removal of Wrecks and Debris. The Village Manager of North Bay Village or such officials as may be designated by him are authorized in the event any boat, vessel, houseboat, or floating home is sunk or seriously damaged within the Village limits or the debris from same is located within the Village limits to order the removal of such vessel, or debris within a reasonable time and in the event that such vessel or debris is not removed within the time specified by the order of removal following service of such order of removal upon the person, firm or corporation owning such vessel or debris shall be in violation of this ordinance and shall be subject to the penalties provided in Section 14. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such hereunder. The Village Manager may affect the removal of such vessel or debris in the event his order to remove same is not obeyed and charging the cost of same against the owner which said cost may be collected in a civil action.

SECTION 13. Repeal of all Conflicting Ordinances. Any Ordinance in conflict with the terms and provisions of this ordinance shall be and the same is hereby repealed.

SECTION 14. Penalties for Violation of this Ordinance. Whosoever shall violate the provisions of this Ordinance upon conviction thereof shall be punished by a fine not to exceed Five Hundred ($500.00) Dollars or imprisonment not to exceed 60 days or both in the discretion of the Village Judge. The Pollution Control Officer of Dade County may be delegated by the City Manager to assist in the enforcement of this Ordinance.

SECTION 15. SEVERABILITY CLAUSE: If any part or portion of this Ordinance is held to be void or declared unconstitutional or for any other reason held to be unenforceable by a Court of Competent Jurisdiction, then the remainder of this Ordinance shall remain unaffected and in full force and effect.

SECTION 16. Effective Date. This Ordinance shall become effective thirty (30) days after its adoption by the Village Council. The provisions of Section 8 (C) and (D) and Section 10 (B) as applied to existing facilities shall not be required to conform until December 31, 1970.

PASSED AND ADOPTED this 17th day of December, 1969.

Harvey Ruvin
MAYOR

ATTEST:

Frieda First
VILLAGE CLERK

First Reading: November 19, 1969
Second Reading: December 17, 1969

point being holding tanks.

And then we required that all marinas, all commercial marinas, tie into the city sewer system, construct an outlet at each docking site.

We had the advice and counsel of the Metro Pollution Department. We had communicated and gotten some very good response from the State agency on pollution. We had to come to those conclusions and the expense of it was more than justified. It came to about $600 a slip, which is about half what it costs the homeowner to tie into a city sewer system.

Well, it is all well and good. We did manage to help our problem in and around our shore, but obviously the effect on the total bay is minimal.

We passed at the same time a resolution that the county adopt these provisions countywide. We thought it made sense. We got no action; we prodded, we got still no action; we prodded again, and we finally got the response that the Federal Water Quality Act which was passed subsequent to our ordinance preempted local intervention in this area.

We pursued it further. Everybody was passing the buck. We pursued it further and we went to speak with then Undersecretary Carl Klein and asked the direct question, "Does this new Act preempt it? because we felt that the new Act had

RESOLUTION NO. 2224

A RESOLUTION RECITING CERTAIN CONDITIONS RELATING TO MASS WATER POLLUTION IN BISCAYNE BAY AND ADVERSELY AFFECTING THE CITY OF NORTH BAY VILLAGE AND REQUESTING AFFIRMATIVE ACTION BY THE COUNTY COMMISSION TO ENACT AN ORDINANCE REGULATING HOUSEBOATS, AND MARINAS, PROVIDING SANITATION AND POLLUTION CONTROL OF THE WATERS OF BISCAYNE BAY.

WHEREAS recent studies have shown that the waters of Biscayne Bay are suffering from wild and uncontrolled pollution which is a threat to the safety, health and welfare of the people of Dade County and a great threat to the millions of tourists who annually enjoy this area and

WHEREAS the City of North Bay Village is the only city in the center of Biscayne Bay, an island community of four islands each entirely surrounded by water and having the largest shoreline for any city of its size and population in the State of Florida and

WHEREAS the Council of the City of North Bay Village has recently enacted an ordinance purporting to regulate and control boats, docks and marinas within its city limits and prohibit further pollution of the waters of Biscayne Bay within the corporate limits, the said Council having recognized the county-wide complexities of these problems.

NOW THEREFORE BE IT RESOLVED that the Council of the City of North Bay Village request that the Board of County Commissioners of Metropolitan Dade County, Florida, enact an ordinance containing provisions to prohibit further pollution of the Bay and to regulate boats, vessels, houseboats, and marinas thruout Dade County and to prohibit the owners and operators of boats, vessels and houseboats or of marinas from permitting further pollution of the waters of Biscayne Bay. It is urged that the County enact in part the provisions of Ordinance No. 219 of the City of North Bay Village and give same county-wide effect.

PASSED AND ADOPTED this 17th day of December, 1969.

Harvey Ruvin
MAYOR

ATTEST:
Frieda Fierst
CITY CLERK

377-B

NORTH BAY VILLAGE

DR. ALBERT [illegible]

[illegible] EAST DRIVE • NORTH BAY VILLAGE, FLORIDA 33141

December 23, 1969

TO: ALL DADE MAYORS, MEMBERS OF DADE COUNTY COMMISSION
THE DADE LEGISLATIVE DELEGATION,
CONGRESSMEN CLAUDE PEPPER AND DANTE FASCELL

Man continues to relate to his environment in medieval fashion.

One need only resort to the newspaper to learn what time the sun will "rise" and "set," yet for centuries we have known that the space particle we inhabit revolves around the sun and not vice-versa. He myopically looks upon earth as a flat, horizontal plane, infinite in all directions and he has treated its resources accordingly.

Recently released studies of samples taken at various points in Biscayne Bay have confirmed what has been suspected for some time. This resource, long a source of pleasure and pride, is quickly becoming no more than a vast sewer. The IMMINENT danger to public health as well as to our economy is clear.

North Bay Village is unique in that it is the only City in Dade completely surrounded by Biscayne Bay. While our land mass is comprised of some 240 acres, we are blessed with 4.7 miles of shore line. There can be no question that NBV has a VITAL and crucial interest in the deplorable condition of these waters.

This concern, I am sure, is shared by all Dade Countians, especially those residing in communities contiguous to the bay.

Although the extent of the problem indicates that many sources and types of pollutants have contributed to the contamination, it is undeniable that effluence from MARINE TOILETS has taken its toll.

Over the last six months our City Council has held lengthy public hearings designed to hear all viewpoints including houseboat manufacturers, marina operators, sanitation engineers, the Marine Council, Metro Pollution Control, vessel dwellers and land dwellers.

Numerous complaints describing actual citings of pollutants in Village waters were registered. Many alternatives were offered as solutions. All available on-board sanitation facilities were studied. Most were found to be totally inadequate and the remainder only partial in effect.

I am proud to be able to report that on December 17th by UNANIMOUS vote of Council, North Bay Village passed into law a comprehensive "Boats, Docks and Marinas" Ordinance. This law requires DIRECT "SEWAGE TIE-IN" to the City's sanitary sewer system from all vessels used as living quarters and makes unlawful all discharge of pollutants into the Bay. The penalty for violation is the maximum punishable under our Charter.

The mechanics involved in tying-in (flexible and detachable fittings to plastic gravity flow pipes to a storage unit pumping directly to the City's system) has been described as completely workable and practicable by Metro Pollution Control. This agency has both endorsed and recommended passage of the ordinance.

The fact that this legislation is the first of its kind in the nation only serves to underscore the grave need for adoption elsewhere.

Admittedly, the major beneficial effect of NBV's move will enure within her jurisdiction limits; and its effect (if not adopted all along the Bay) on the total problem will be minimal. I submit, however, that NBV is both a logical and CONSTRUCTIVE point of beginning.

Biscayne Bay and its future is both an asset and a responsibility of all of Dade's sister Cities.

In this spirit, I am enclosing for your consideration the full text of the Ordinance as well as a Resolution urging county-wide adoption of its anti-pollution provisions which will be submitted to the Commission at its next meeting.

Sincerely,

Harvey Ruvin

HARVEY RUVIN
Mayor

HR:hp
Enclosures

377-D

Mayor
HARVEY RUVIN

Vice-Mayor
[illegible] ALBERT SEIDEN

[illegible] EAST DRIVE • NORTH BAY VILLAGE, FLORIDA [illegible]

December 23, 1969

Honorable Porter W. Homer
County Manager, Metropolitan Dade County, Florida
Suite 911, Dade County Courthouse
Miami, Florida, 33130

RE: North Bay Village Boats,
Docks and Marinas Ordinance

Dear Porter:

I am pleased to enclose herewith for your examination a copy of the ordinance recently adopted by the City Council of North Bay Village regulating boats, docks, waterways and marinas. As you are aware, we have been working on this ordinance for more than one year and I believe that it is probably the most comprehensive regulatory ordinance which has been adopted by any local governmental unit.

Section 1 of the ordinance adopts by reference the provisions of the Florida Boat Registration and Safety Law as provided for in Florida Statute 371.59. Section 2 contains additional definitions.

Section 3 of the ordinance regulates private docks, preventing the use of docks in residential areas for commercial purposes or to otherwise lower the standards of waterfront property in the City. This has been done by limiting utility hook-ups in residential areas and prohibiting leasing or sub-leasing of docks. For this purpose, we utilized in part portions of the Code of the City of Ft. Lauderdale.

Section 4 of the ordinance provides restrictions of a general nature on all docks and piers. The ordinance restricts construction of docks more than 25 feet perpendicular from the shoreline into any waterway. Setback restrictions for docks have been made consistent with the general provisions of our City Code. Approval of reconstruction or repair of docks is vested in the City Manager, if the plans originally approved by Council are unchanged. The reason for this provision is to prevent the delay of Council approval following a hurricane or other natural diseaster where it has been the experience of this City that there are many docks which require repair work. The procedures to be followed by persons applying for construction of dock facilities were adopted from the Code of the City of Newport, California.

Section 5 of the ordinance requires registration of vessels with the City when they remained docked for more than 24 hours. At the request of the Marina operators, this provision was modified from the original draft which required that they supply such records to the City to the present provision where they must maintain their own records and make them available for inspection by the City at the City's request. The marinas operators advised us that this procedure was feasible and would enable them to cooperate. This section also requires that non-Florida boats docked in the City must meet the requirements of the Florida Boat Safety Act. This provision is necessary because many of the vessels docking in North Bay Village are of out-of-state or foreign registration.

Section 7 is entirely new and is included primarily to meet what we believe to be an ever growing problem, that is, businesses operated from houseboats. We have attempted to make our zoning provisions applicable to the adjoining waterways and we feel that this is somewhat of a unique approach. In North Bay Village we have recently had requests for professional offices, specialty shops and several bars to be operated on houseboats.

Section 8 provides comprehensive regulation of marinas. The dual classification of marinas as "ancillary" and "business" marinas is to permit an apartment or hotel with a small dock used exclusively for the storage of a tenant's vessel other than a houseboat while it is not in use from the requirements of a marinas where vessels including houseboats and floating homes are being used as a residence or for commercial purposes. The specifications included in sub-section (C) constitute the basic anti-pollution provisions of this ordinance. They were the subject of much debate and exhaustive research on the part of both the proponents and opponents of this ordinance. Most persuasive was the finding by the Dade County Pollution Control Officer that a hook-up to the permanent sewer system of the City was the only method which realistically would prevent further pollution of the City's waterways by waste and sewerage from boats, vessels, houseboats and floating homes moored in marinas on a permanent basis. Sub-section (D) sets forth a few safety requirements designed to prevent further pollution of the waters from oil and fuel as well as to prevent the danger of a marina dock fire. The language used in these sections was adopted at some length from the model ordinance which is included in the 1967 Cumulative Supplement to Matthews "Municipal Ordinances". Sub-section (E) provides increased excise taxes and regulatory fees. We feel that this is justified since these boats enjoy all the services provided by the City while they are in all respects exempt from municipal taxation. Under the provisions of Article VII, section 1 (b) of the new Constitution of the State of Florida, houseboats without their own propulsion units are completely exempt from taxation while those having motors pay only an excise tax to the State under the provisions of the Motor Vessel Registration Act.

Section 9 of the ordinance constitutes a strict pollution control and sanitation provision. There is some question as to the effect of legislation presently pending in the Congress of the United States regarding the preemption of this field by the federal authority, however, it is hoped that the Congress will permit local government to enact the type of strict regulation contained in this section of the ordinance and thus to protect their own waters from further pollution.

Section 10 which regulates houseboats and floating homes contains both an anti-pollution provision consistent with section 8 of the ordinance and a requirement that houseboats be constructed in accordance with applicable building code provisions.

Sections 11 and 12 contain hurricane and storm regulations and provisions for removal of wrecks and debris particularly applicable to Florida.

Section 14 contains the penalty provision of the ordinance and provides that the County Pollution Control Officer may be delegated to assist in the enforcement of the ordinance. This, of course, will require a resolution of approval from the County Commission.

The effective date contained in section 16 is thirty days after the adoption of the ordinance. In addition, however, existing marinas have been granted until December 31st of 1970 to conform as the City recognizes these operators could not have anticipated the addition expense required in their conforming to the provisions of the ordinance.

Since the original draft of this ordinance was represented to the City Council of North Bay Village in June of 1969 after more than six months of research and preparation, there have been a series of public hearings and public conferences before both the City Planning and Zoning Board and the City Council. There have been numerous changes made and several intermediate drafts of the ordinance. Many of the complaints made by interested parties have resulted in substantial changes in the ordinance. It should be noted, however, that the original anti-pollution provisions contained in the first draft have been adhered to and I am convinced that their enactment on a county-wide basis by the Board of County Commissioners of Metropolitan Dade County offer the only possibility of alleviating the problem of uncontrolled pollution of Biscayne Bay. It was to deal with this type of a county-wide problem that Metropolitan government was formed.

I am forwarding copies of this letter to the County Attorney's office and will be most happy to meet with Tom and his staff at their convenience to go over our background and research material. You may depend upon me to be available at your request if I can offer you any further assistance.

With warmest personal regards, I remain

Your good friend,

Joseph H. Weil

JOSEPH H. WEIL
City Attorney

JHW:cdw

cc: Hon. Thomas Britton
County Attorney
cc: Hon. Stewart Simon,
Ass't. County Attorney
cc: Hon. Ralph Smith,
City Manager, North Bay Village

as its only intent as far as houseboats and pleasure boats to make uniform procedures. Obviously, if every little area is going to make its own rule, we are going to run into a problem. We already have a problem. But they wanted to make uniform procedures for boats that were freely moving, and it seemed to me the intent was not to reach residential use of shorelines. That certainly would be left up to the particular municipality in the exercise of its police power.

And we got pretty good agreement on these points--that it was not preempted, that there was a specific section in the new Act which said that this does not preempt stronger provisions by the local agency after first applying to the Department of the Interior. And thirdly we got the interpretation that what we were talking about was not a marine sanitation device, quotes, as used in the Act itself, so the Act wouldn't even come into play.

Now, I have come here really to see whether or not we can--this kind of a hearing is tremendous because we are obviously involving all levels of government--how can we move this thing off of dead center? We have had some changes in personnel also at the county level. But I think that we need some kind of directive, some kind of definitive answer from the Department of the Interior to state as a matter of record that the new Act does not preempt and if so, if that is their finding, then the ball is squarely in the hands of local government and they have got to do something about it instead of just saying, no, we are preempted.

So humbly that is what I am asking. I am no longer the Mayor of North Bay Village. The term of my resignation when I ran for the legislature, the terms of it were that I would continue this effort to try to get wider passage of it. I think it is important. And I think to just make one statement, that here is an opportunity to show a commitment to a specific source and hopefully that can carry on.

MR. STEIN: Mr. Reed.

MR. REED: Mr. Ruvin, I can't tell you how I appreciate your remarks here today. Recently an application for a vast new addition to the Dinner Key Marina came by our office requiring a permit because of the multiplicity of new boats that would be tied up for live-ins. After considerable consultation with staff we denied the permit, both because of the anaerobic condition of the bottom muds which would have to be pumped up for the marina and which a very indifferent plan of pumping was presented to our Board, and secondly because in my opinion an addition of this size to an existing source of pollution that is just gross--I think the Dinner Key Marina is a gross source of pollution--I couldn't buy unless hookup was going to be stipulated. I spoke before the cabinet and urged them not to grant the permit to Dinner Key without the stipulation that they would provide hookup service for the boats and the cabinet passed it.

Since that time I have received some of the most outrageous pieces of mail from the regulatory agencies of this county and from individual people in the city of Miami I have ever received in my life accusing me of everything. I have ruined the bond issue; I have ruined the city of Miami. I have received letters from the boating council and it goes on and on and on. And I don't feel like budging at all on this thing.

MR. RUVIN: I certainly congratulate that kind of a stand. It is what is needed. Because you see, part of the problem is this, that we all admit that there are many sources. The boating industry itself and the boating people--and I have gotten some of those letters, probably from some of the same people--they are very iconoclast people.

First of all, when you live aboard a boat you are taking sort of a stand that sets you a little bit apart. These people do not like anybody evaluating their form of life. That is their lifestyle. But they don't want to be singled out. They don't want you to say to them,"Well, you have got to stop but everybody else can continue."

But my point is this, that we have got to just make a commitment and take each source separately because we can get lost up in the clouds of these philosophical generalities and nothing seems to get done.

And as far as--

MR. REED: Let me ask you, did you give a time limit?

MR. RUVIN: Yes.

MR. REED: What was your time limit?

MR. RUVIN: It was the 1st of this year, January 1, 1970.

MR. REED: Was that a year, in other words, from the time--

MR. RUVIN: One year.

MR. REED: One year.

MR. RUVIN: With a procedure for extensions if at that time they were justified. Now, in my eyes, I know that they have looked into some engineering proposals on how to do it. The Department of the Interior has just finished some very interesting studies which come up with a new way of doing this--storing it on the bottom of the body of water in a large collapsible container which can pump it then into it, so that you don't have to worry about the gravity flow.

MR. REED: Specifically, if we put all live-aboard boats in the Miami River on a 1-year time schedule, this would be identical to what you did at North Bay Village.

MR. RUVIN: Absolutely.

MR. REED: If we put everybody at Dinner Key on a 1-year basis who is living onboard a boat, using it as a domicile and putting their sewage raw into the bay, this would be in conformity with what you did in North Bay Village.

MR. RUVIN: Absolutely. You know, it is interesting to also note that when Metro reviewed this ordinance they asked each of the departments within Metro to give a conclusion, to evaluate it. Every one, with one exception, was in favor of it. The only one that was against it was the Parks Department, and their answer was that we have got a crucial need for spaces, we have got 10 demands for a boating slip for every one that we have.

But to see the stand that you took with regard to Dinner Key is great. We have got a problem now coming up with the Miami Marina,"Miamarina" I think it is going to be called. I think they are going to have a live-aboard facility, and they haven't faced this problem. If we just continue to blithely go ahead and build marinas because we have the need, it is not only self-defeating but with what we know about it now it is criminal.

MR. REED: Thank you, Mr. Ruvin.

MR. RUVIN: Thank you.

MR. STEIN: Mr. Ruvin, let me address myself to this. I think you have a fundamental question here with this notion of preemption. If you are proposing--and I take it possibly you are--that we do the same thing at this conference that we did at Lake Erie and Lake Michigan, i.e., direct the localities and the States to put in requirements that macerator chlorinators would not be acceptable and you would have to have holding tanks and have them **emptied** on the shore facility, this is fine. I guess we have to face it. If this continues, and evidently it is a problem here, I surely will bring it up with the conferees and we will face it.

But this other question of whether it is Federal law, or we preempted it, or something of that kind, it seems to be the kind of procedure whereby we are not going to get pollution control. If you know you need clean water; if you know you have to do something about it; and if you are going to put in a system that is going to prevent pollution, there isn't going to be any regulation--Federal, State or local--that is going to hit you if you have done the job right. In other words, if you have facilities in Biscayne Bay on those islands for those boats that you have to have cleaned up, why don't you go ahead and do it? If you do it right, this question of preemption isn't going to affect you one bit. Whatever the regulation is you are going to meet it.

Furthermore, you will have a headstart toward clean water. I take it from what you say--and I would like to hear from the conferees on this--if this is a problem, we have ample evidence that we just take action under the Federal-State conference operation to meet the problem, and we will let those Federal regulations or State regulations catch up with us.

MR. RUVIN: Mr. Stein, just to clarify, excuse me, we are crisis oriented. Every time something comes up we have got to look around to see who is preempted, who is in the field, who is out there, what is happening. It goes back again to planning.

But I just want to clarify one point and that is that I am not saying preemption is a problem. I don't think it is. I think that local government and State government has every prerogative and jurisdiction to move when the area of concern is a residential use of the shoreline.

We did what we could in North Bay Village. We had a unanimous council that acted, I think, as responsibly as it could have. We then moved to the next higher form of government, the county form of government. We asked to have this provision evaluated and adopted countywide if it met what we thought it was. They said "yes, it does meet; it is good; we want to have it; it does have merit," to quote the County Manager Homer when he said, "it has merit; we want to do it; but we think that we are preempted."

And they never really sought an opinion. I did and I got something favorable. I just want to get it clarified and a matter of record.

MR. STEIN: I think we, the conferees, and the State people have had sufficient discussion about the effectiveness of the various systems in dealing with wastes created aboard boats. The sole question here is whether this is a significant source of waste going into Biscayne Bay. If it is, we will ask the conferees to review it at their Executive Session.

MR. RUVIN: The Miami Herald listed it as ninth out of 10. I think that there is no doubt about it, it is significant. There are others that are more so.

MR. REED: As one conferee, Mr. Stein, let me speak to the point. I think it is significant, especially in Palm

Beach, Broward and Dade Counties. It would be applicable to all three counties.

MR. THOMAN: It is very significant, former Mayor Ruvin. We will take it up.

MR. STEIN: Thank you very much.

Any other comment? If not, thank you, sir.

MR. RUVIN: It was a pleasure.

MR. REED: George A. Borun, Product Manager, Waste Treatment Systems, Culligan International, Northbrook, Illinois.

GEORGE A. BORUN, PRODUCT MANAGER
WASTE TREATMENT SYSTEMS, CULLIGAN INTERNATIONAL
NORTHBROOK, ILLINOIS

MR. BORUN: My name is George Borun, as he mentioned, and I am a representative of the industry that provides the equipment used to purify water for home and industry and also provide commercial and industrial waste treatment systems, not of the biological types. I can't take credit for the nonfunction of the systems as illustrated here by the slides.

We are charged with the task of engineering systems for a specific industry in order to conform to those requirements set by law. There must be contact between the regulatory and the enforcement agencies and the water treatment industry.

G. Borun

We are allied in purpose. You say "how much" and "why" and we say "how to" and "with what?"

As a spokesman for this industry, may I state that we are making a personal commitment in time, money and manpower to solve the problems related to water purity and health. Many inroads have been made in the technology related to water treatment. Civilization obviously would have perished before now had it not been for industry or an effort, as our industry, to provide for the need. We are trying to keep up with this need. Contemporary problems such as mercury removal from industrial wastewater has been solved by technological advances made by the industry, by the water industry itself.

The government is not the only one that is basically doing something about our problems. We in this industry are making a commitment and investment to this goal. Our efforts are directed not only to treating wastes but reducing waste volumes and conservation of water, which is a most valuable commodity.

It has often been stated at conferences of this nature that all of the waste problems that we now have today are solvable by today's technology and that is true. Then you ask, but why hasn't something more been done? And the main reason that effective control has not been implemented is the old nemesis, money, money for enforcement and money to do the job. Often the cost of pollution abatement will be so great that it will put a small company out of business. Sometimes this may be a case of the best thing for society.

So you can see our obligation in the industry. We must provide effective and economically practical hardware to do the job. Society again must create an economic environment that accepts the inclusion of the cost of pollution abatement into the cost of the finished product. In order to make this a truly workable system, we must uniformly enforce realistic waste ordinances across the country so that there is no refuge for someone who pollutes. In this manner, no manufacturer would have a competitive advantage by not having to include pollution abatement in the operating cost.

Local tax incentives for industry with pollution control systems creates an atmosphere of understanding and cooperation between people and industry. The water conditioning industry has been fighting this problem for decades. We welcome all help.

Thank you.

MR. STEIN: Thank you, Mr. Borun. There may be one statement here, George, that at least from my point of view you overstated just slightly. I think industry has made th advances in the mercury reduction, but I don't think we have solved that problem yet. I think we are on our way to solving it.

MR. BORUN: The technology is there for a mercury removal unit from wastewater. This is something fairly recent. A publication has been made within the last two weeks. Sometimes it takes a little while for it all to get--

MR. STEIN: Mercury removal down to how much, George?

MR. BORUN: I must excuse myself. This is not my bag.

MR. STEIN: For the purpose of this, I don't know that the regulatory agencies are going to be satisfied until we get zero mercury. I don't want to go into this, but as long as we are here and I know you are vitally interested in it, we have to face the problem. We have gotten places down from 200, 40, 60, 20 pounds down to 3 ounces. If they are putting 3 ounces of mercury out, say, in 20 million gallons a day, there isn't very much mercury in each bit of water. And when we scrabble for those last few ounces, that is when we have our problem. I am not sure we have that licked yet.

MR. BORUN: That is very true. We are also working in other areas, too, on reuse of water, whereby multiple-purpose water is eventually a thing of the future, where you will have a number of different sources of water coming into the home used for drinking, potable uses, and sanitary wastes.

MR. STEIN: Thank you.

Mr. Reed.

MR. REED: Howard Burr, President, Conservation Industries?

Dale Millman, Founder of Envinromental, Miami Dade Junior College, South Campus, Miami, Florida.

MISS DALE MILLMAN
ENVIRONMENTAL ORGANIZATION
MIAMI DADE JUNIOR COLLEGE, SOUTH CAMPUS
MIAMI, FLORIDA

MISS MILLMAN: Good afternoon, gentlemen, and thank you for giving me this opportunity to speak.

My name is Dale Millman and I represent the membership of the Environment Organization of the Miami Dade Junior College, South Campus, and the students of the ecology class of said campus, and indirectly the Environment Organization at the University of Miami.

Our purpose is to educate ourselves, pass on the information to others and to act in all environmental problems that affect us as a part of the great chain of life. We recognize we are in a period of crisis now. We didn't have to go to college to learn that.

The generation gap does not enter the problem of pollution. Pollution affects everyone, with no prejudice whoever breathes, eats or drinks water.

The only contrast is that the younger generation would like to see improvements made now or else what kind of a future do we have to look forward to for ourselves and for our children? We have grown up in a country where signs warn throughout the Nation that certain swimming areas are closed due to pollution. To carry Mr. Stein's analogy further concerning the Potomac River, it is a health hazard, whereas if anyone sailing on said river falls in, he is immediately taken to a nearby hospital for observation. Government, please enforce laws to control Florida's water before we are destined to this kind of a disaster.

We don't want our children to use history books or other reference texts to learn about the pleasures the ocean once brought to us as a media for swimming and other water-related activities. We don't want to be forced to resort to pools for such activities in the future--an artificial environment opposed to a natural one.

The problem of fish staying in the water from lack of oxygen due to pollution directly affects us. What happens when we eat a diseased fish?

If the level of oxygen content is allowed to deplete, what type of drinking water do we have to look forward to, bottles of distilled water? Milk is bottled now and children are reminded of cows. Will we have to remind our children about fresh running water into our homes through faucets?

The students would like to work within the system, but what kind of examples have you set for us? You provide legislation against water pollution and then it isn't enforced, whereas a student leafleting without a permit last Saturday from the University of Miami, in an attempt to educate the public about the dumping of raw sewage into the ocean off of Miami Beach and informing the public where they can go to get typhoid or tetanus shots before swimming in the ocean, he gets arrested. A law is enforced. But which is the more serious offense? Why isn't the law enforced in Miami Beach? Then there would be no need for leafleting in the first place.

We have no quarrel with the laws governing water pollution. Our only quarrel is in the enforcement of these laws. Why isn't the government doing their job?

Zoning laws are a need so as not to overstrain the existing sewage systems which are already belching with the sewage strain it has now imposed on them.

There isn't too much more I can say except just please enforce these laws so we do have a future to look forward to. You have enjoyed these things in the past and you may not have to worry about it in 20 more years, but we will. (Laughter and applause.)

MR. REED: I thought that was a wonderful statement and I hear you loud and clear.

MISS MILLMAN: Thank you.

MR. STEIN: Thank you.

MR. THOMAN: Miss Millman, I have a suggestion for you. There is one way to be heard even louder and clearer and that is organize all of the students and get them out to vote on November 3 and vote for those people who are going to support your interests.

MISS MILLMAN: That is right. Don't be deceived. The students, many of them, are over 21 and we are of voting age and we want to see these laws go into effect and have legislators who will--

MR. THOMAN: Excuse me. I come from Georgia. They permit voting at 18 there. (Laughter.)

MISS MILLMAN: Thank you.

MR. STEIN: I know several students who are over 21.

I am supporting them myself. (Laughter.)

Mr. Reed.

MR. REED: Mrs. S. L. Horn, Director of Beaches and Waterways, Key Biscayne Taxpayers Association, Key Biscayne. Is she here?

MRS. HORN: Yes, sir.

MRS. S. L. HORN
DIRECTOR OF BEACHES & WATERWAYS
KEY BISCAYNE TAXPAYERS ASSOCIATION
KEY BISCAYNE, FLORIDA

MRS. HORN: Good afternoon, gentlemen. I am Mrs. S. L. Horn of Key Biscayne. I would like to thank you very much for coming--

MR. STEIN: Would you mind speaking up or closer to the mike? They can't hear you.

MRS. HORN: All right, sir, because I do want you to hear what I have to say.

I would like to thank you very much for coming and listening to our many problems which we have on Key Biscayne and in this area which affects each and every citizen of the world. Since I am appearing as a simple citizen, I would like to speak in very simple terms.

Mrs. S. L. Horn

The main source of pollution, of course, is people. Too many people in a compressed area causes such a demand on services that those services become overloaded and result in pollution. It is a vicious cycle. To use my home and the home of your boss, Key Biscayne, as an example let me cite you some of the problems. Our drinking water reservoir is supposedly in a very filthy condition. We do not have adequate water pressure for the 7,000 residents already there and yet our local county government, through zoning exceptions, is allowing a rapid development onto Biscayne. An example is a 27-story high-rise that is now under construction. This will make an additional 500 people using the utilities that are there that are already under strain. With each high-rise an additional burden is placed on water, sewer and all of the utilities that mankind needs.

Therefore, we request your help in declaring a moratorium on building permits and most especially occupancy permits until such time as the master plan can be pursued. This will not create a hardship on anyone except those who have created their own problems and will give relief to the citizens who await local improvements.

I would like to ask that those improvements coming in the future be gained to the taxpaying residents of the community first and then the tourists.

We also are facing the development of three more golf courses and ESSA, which is a government building, and several other apartment buildings on the Key. All of these would have to get their water from the main that is being placed there sooner or later.

Now, then, I would like to pose a question. Why have our local officials not held the line on the new development until they have updated our services? The waters off our causeway public recreation area are polluted according to this map, which I would like to give a copy of to each one of you gentlemen, from the Pollution Control Department and yet our officials feel that it is impossible to close these waters as unsafe to water contact sports. It is a crime to continue to allow the development of any area based solely on a monetary return when the people already residing in that area cannot get adequate services.

I repeat, gentlemen, we urge this conference to prevent compounding the problem. Please give serious thought to the moratorium on building and occupancy permits until the services already provided for the existing residents are brought up to a maximum degree.

We hope you will adopt the following as your slogan:

METROPOLITAN DADE COUNTY • FLORIDA

864 N. W. 23RD STREET
MIAMI, FLORIDA 33127
TELEPHONE 377-5891

DADE COUNTY POLLUTION CONTROL

March 19, 1969

Mr. Sidney Levin
General Manager
WKAT Broadcasting Company
1759 Bay Road
Miami Beach, Florida 33149

Dear Mr. Levin:

As you requested, the MPN sampling results are as follows: (See enclosed maps for sampling sites).

Station	Count	Date of Sampling
1	1600+	3/12/69
2	1600+	3/12/69
3	1600+	3/12/69
4	220	3/12/69
5	240	3/12/69
6	110	3/12/69
7	170	3/13/69
8	1600+	3/13/69
9	1600+	3/13/69

Five of the nine stations indicate a presence of Ecoli Bacteria higher than 1,000, which is considered to be the maximum concentration allowable for water contact sports.

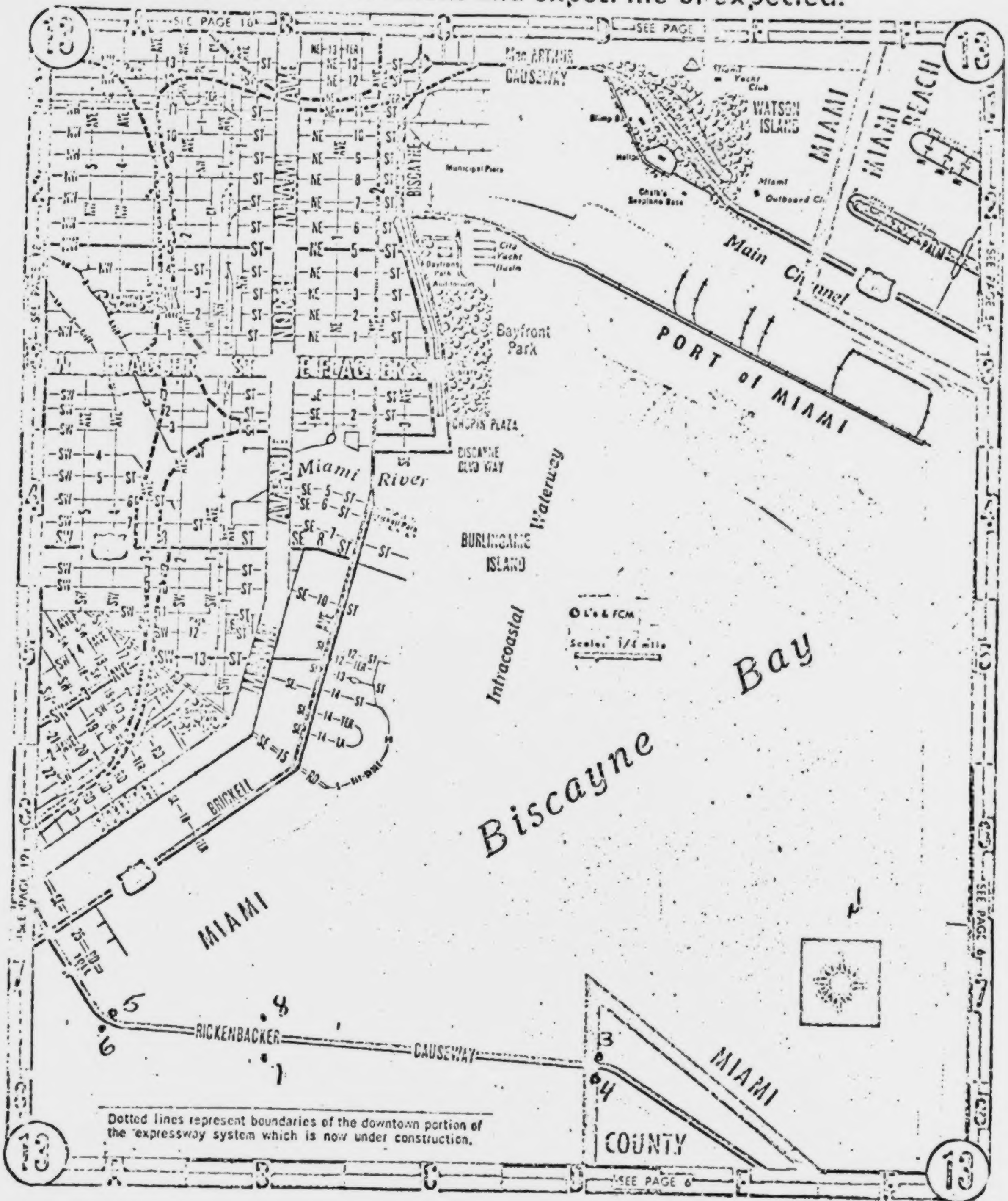
Very truly yours,

Paul William Leach, Director
Pollution Control

PWL:FJA:lkr

Enclosures

Slow for intersections and expect the unexpected.


SEE PAGE 16
SEE PAGE
13
MacARTHUR CAUSEWAY
Yacht Club
WATSON ISLAND
MIAMI
MIAMI BEACH
Municipal Piers
Blimp Base
Heliport
Chalk's Seaplane Base
Miami Outboard Club
City Yacht Basin
Bayfront Park Auditorium
Bayfront Park
Main Channel
PORT of MIAMI
NORTH
AVENUE
BISCAYNE
W FLAGLER ST
E FLAGLER ST
CHOPIN PLAZA
BISCAYNE BLVD WAY
Miami River
BURLINGAME ISLAND
Intracoastal Waterway
Scale: 1/4 mile
Biscayne Bay
BRICKELL
MIAMI
RICKENBACKER
CAUSEWAY
MIAMI
COUNTY
SEE PAGE 6
SEE PAGE 19
SEE PAGE 14
A
B
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1
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Dotted lines represent boundaries of the downtown portion of the expressway system which is now under construction.

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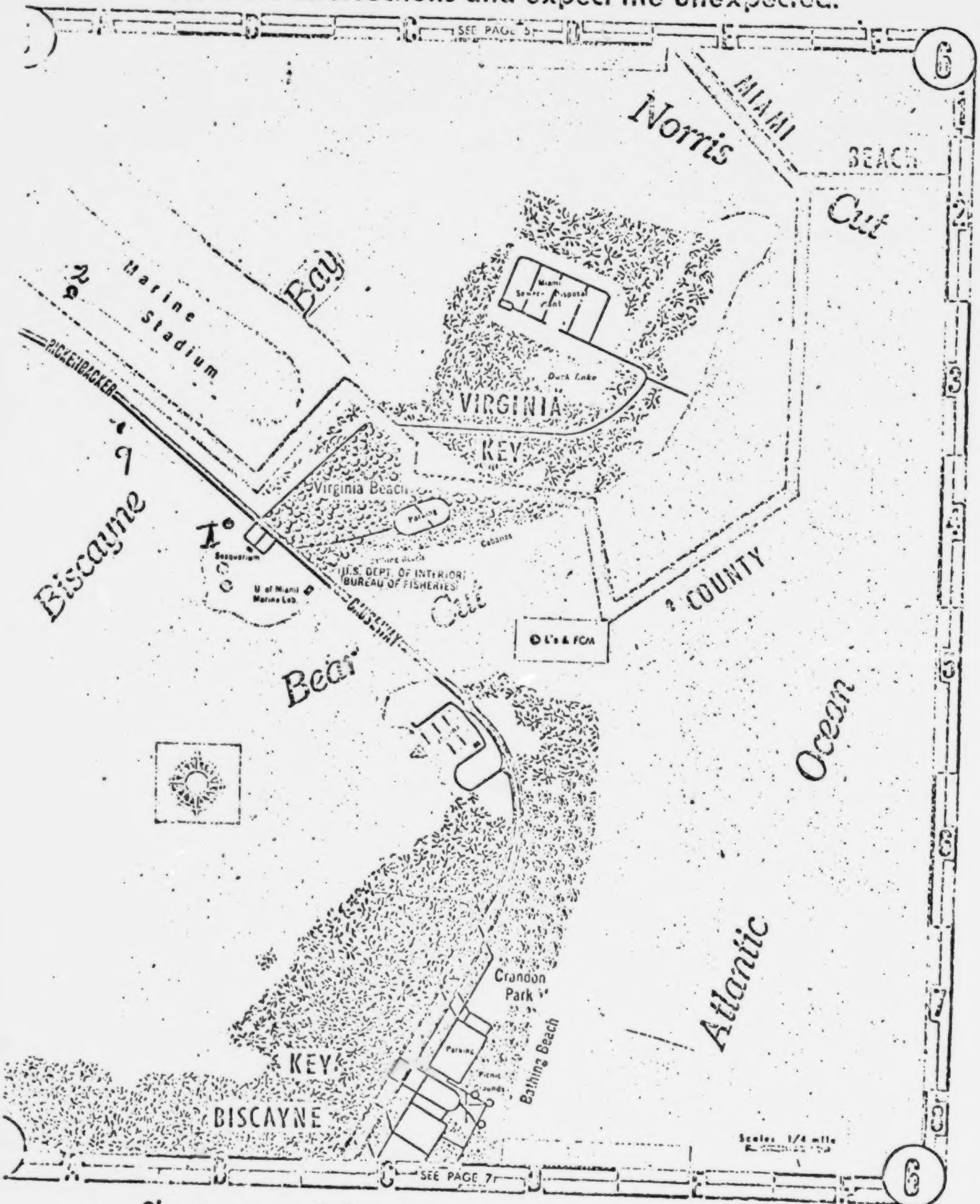
Slow for intersections and expect the unexpected.


SEE PAGE 5
6
MIAMI
BEACH
Norris
Cut
Marine
Stadium
Bay
RICKENBACKER
Miami Sewage Disposal Plant
Duck Lake
VIRGINIA
KEY
Virginia Beach
Parking
Cabanas
Seaquarium
U.S. DEPT. OF INTERIOR
BUREAU OF FISHERIES
U of Miami Marine Lab
CAUSEWAY
Biscayne
Bear
Cut
COUNTY
© L's & FCM
Ocean
Atlantic
Crandon
Park
Bathing Beach
Parking
Picnic Grounds
KEY
BISCAYNE
Scale: 1/4 mile
SEE PAGE 7
6
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Show your driving intentions by proper signals.

We will find a solution to pollution.

Thank you.

MR. STEIN: Thank you, Mrs. Horn.

Are there any--

MR. REED: Mrs. Horn, where does the sewage go from Key Biscayne? Is there a treatment plant on the island?

MRS. HORN: There is one on Virginia Key.

MR. REED: It goes over to Virginia Key and then goes out the Miami outfall?

MRS. HORN: Right. Anything else? I will hand you these pollution maps, if I may, please.

MR. STEIN: Are there any other questions?

MR. PATTON: Mrs. Horn, are all the residences on the sewer system?

MRS. HORN: No, sir, we have about 500 residents on septic tanks. There is another gentleman here, Mr. Jack Strehle, who is going to tell about the sewers.

MR. REED: He is next, right.

MR. THOMAN: And you are claiming that the facilities are not adequate to take care of the developments that are occurring over there?

MRS. HORN: That is right, sir. I don't know whether Mr. Reynolds has left or not, but at a Water and Sewer Board meeting that was held, I believe in May or June, I spoke and asked Mr. Reynolds some very pertinent questions, we felt, from our group. They have promised us another main and a booster pump, which I believe is--there is one at the foot of the causeway now and another one that is to be put in. But there is also a golf course that is going in. According to the plans they have estimated that they will need 1,250 gallons per minute for the golf course. I am looking because I don't have the facts and figures, I am sorry, in front of me. With the additional high-rises and apartments that are going up on Key Biscayre, they figure that we will need approximately 24,000 gallons per minute with the new facilities that the General Waterworks is to supply to the island. We figure in a rough estimate that there is already going to be about 21,000 to 22,000 gallons per minute that will be needed for all these people, so, you see, there is really not too much in reserve and during the dry spells, as you know, people want to water their lawns and they drink more water, and so forth.

So we do have many problems, and I know it is not only affecting Key Biscayne--I don't mean to be selfish and point out only our problems--but I think our problems do become multiplied throughout the Nation and the world.

MR. THOMAN: Your own problems are the most important to you.

MRS. HORN: Well, that is true.

MR. THOMAN: That is what we like to hear about.

MRS. HORN: We do have our problems. And I do thank you gentlemen for your time.

Any other questions?

MR. REED: Thank you so much.

MR. STEIN: Thank you.

You know, while you are here, we should point out, Mrs. Horn, that you raised one of the central problems of our time. So people won't be disappointed, I think it is important to recognize what a board like ours of pollution control officials can or can't do. If you persist in putting up golf courses and highrise apartments, there is just about so much you can do. We don't have and I am not sure that you want the Federal Government or the State government to have land use requirements. This is true everywhere in the country. I live in a corridor in the East, in Virginia, that is part of a strip from Boston to Richmond where highrises have been built all over the place and everything paved. Once you do that you may be fighting a losing battle.

I don't know what you can do about it. People frequently get very disappointed with the environmental people and the pollution control authorities. Let me just give you an example. Maybe you are experiencing that down here because I surely see it in my own area.

As I said, I live in Virginia. About 15 years ago when we moved out there, we had a 2-lane highway, a dirt road, and we had a well and a septic tank, etc. As a matter of fact, we just got a sewer in a few weeks ago. No longer is there a 2-lane highway that you can barrel down at the speed limit without seeing another car. We now have a 4-lane highway, highrise apartments, shopping centers, filling stations, etc.

Now, no matter what someone like Mr. Reed or myself can do, you can't transform that area or any area into what it was, say, 15 years ago. This is what I wanted to make clear to you. Once these decisions are made on land use, these areas get changed. They really get fundamentally changed. All we can do is deal with it the best we can.

The greatest disappointment people have in their pollution control officials is evidenced when they ask you, "Why didn't you clean this up to an ideal?" We can't really do this if we persist in putting up 27-story highrises--the place is automatically different. I ask you to consider we all have to think this thing out and we all have to work together, but although we try, please don't look to us to do the impossible. We really can't change the face of the world.

This is the issue of our time. You are going to have more people. You have increasingly more people living down in Florida all the time, and presumably what we are trying to do is preserve the environment and accommodate all the people who want to live here. This is the awful task we face.

Again, the reason I am putting this forward is that there is no greater area of misunderstanding of what I consider a conscientious public official, such as Mr. Reed, Mr. Patton, Mr. Thoman, possibly myself, than trying to do a job and yet getting people to indicate that this just is not the same.

MRS. HORN: Mr. Stein, may I have just another moment to ask you something?

MR. STEIN: Surely.

MRS. HORN: We are not a group that has sat back and done nothing. We have tried very hard, and fortunately the health department and the pollution control departments are turning down some of these permits now because they realize that we really do have a problem on water and sewer lines. However, when you attend some of our zoning or appeal board meetings and then--well, I don't want to get into that too much, but then you appeal it to the commissioners, the commissioners understand a little bit more, but the zoning appeal board people, of course, are only ruling on zoning per se, and whether or not they are going to give them special exceptions or variances to the plans. They are not really interested in the electrical and the plumbing and the so forth. But this, of course, needs to be corrected from the local level up.

And I am like you, Mr. Stein, the Federal Government does have an enormous job. But I feel as a citizen of the United States that the more control that we can keep within our own hands, county and State, the better it is because the Federal Government is only made up of people like us on the local level.

MR. STEIN: That is right.

MRS. HORN: However, you have come here to listen to us and we do appreciate it. So, therefore, this is what we were trying to do, is to appeal to you perhaps for a suggestion for local citizens. I think everyone here, of course, has their own little red wagon to pull, and perhaps you can help our local authorities to understand. I don't know what the solution is going to be to our problem because, believe me, we have tried every source. As I say, fortunately the pollution and the health department are holding up some of the permits on Key Biscayne right now.

MR. STEIN: Mrs. Horn, I think you have hit a fundamental truth, but let me try to drive this home, because I think this is a very key point.

One, you ask who is the Federal Government. Do you know who the Federal Government is? You are the Federal Government.

MRS. HORN: Right.

MR. STEIN: That is right. Or you are the State government. That is who the government is.

However, I think in our society you would not want--I sense this--the Federal Government or the State government to deal with a question of land use. Once the central government has that kind of power, you may get the kind of government that you just don't want and you may be giving up too much for water pollution control or any other single issue. After all, the Federal Government is a government of limited powers,and I think we should stay there.

Now, I also do think that difficult as this may sound you have to solve certain problems on a local level. Because I am going to go to a local situation, let me go off the record a minute.

(Off the record.)

MR. STEIN: Let's go back on the record.

Mr. Reed.

MR. REED: John E. Strehle, Director Utilities, Key Biscayne Property Owner and Taxpayers Association, Inc., Key Biscayne.

JOHN E. STREHLE, DIRECTOR (UTILITIES)
KEY BISCAYNE PROPERTY OWNER AND TAXPAYERS ASSOCIATION, INC., MIAMI, FLORIDA

MR. STREHLE: Thank you, gentlemen, for the opportunity to address you this afternoon.

My name is John Strehle and I reside on Key Biscayne at 355 Westwood Drive.

MR. STEIN: Would you speak up a little louder, please.

MR. STREHLE: Yes, sir. Is that any better?

MR. STEIN: Yes.

MR. STREHLE: I have been a resident and property owner on Key Biscayne since 1951. I was among one of the first to establish residence on the island. I am in charge of the responsibility of this Association to investigate and validate complaints by some of our residents on the island. In this capacity, I would like to focus attention on sewage problems that presently exist over there.

There are approximately 500 residence family dwellings on Key Biscayne presently utilizing septic tanks as a means of disposing of wastes. This situation, gentlemen, exists after nearly 20 years from the time that the island was first opened for development. The last five to seven years has seen an intense development program involving the erection of apartment buildings and highrises. And I don't want to be repetitive from the last speaker.

This situation is severely taxing the existing facilities on the Key, particularly in regard to the water supply requirements and sewage disposal. In our judgment we feel that since present standards as established by Dade County are not now being met, serious hazards to health and the general welfare are being encountered.

Again this presentation is going to touch on the land use, but I don't want to get into that can of worms at this time.

Anyway, the copies that I have provided the panel on this sewage system over there is indicative of the situation that we are faced with and I think that it is well that you get acquainted with this situation.

Thank you.

MR. STEIN: Thank you. Are there any comments or questions?

Thank you very much.

MR. REED: Mrs. I. E. Perry, Conservation Chairman, Bel-Aire Women's Club, Miami, Florida?

Ken Quina, Consulting Engineer, Septic Tank Industry, Miami, Florida.

KEN QUINA, CONSULTING ENGINEER
SEPTIC TANK INDUSTRY
MIAMI, FLORIDA

MR. QUINA: Thank you. My name is Ken Quina. I am a Consulting Engineer and I am representing the Septic Tank Industry of South Florida.

On behalf of that industry I would like to welcome you to the septic tank country. Here in Dade County we have 450,000 septic tanks. Also below Lake Okeechobee in Florida we have approximately over half the population of the State of Florida and 3 percent of the water in the State of Florida. So when I am here speaking for septic tanks, I am speaking for the water in the State of Florida.

Our pollution control department in Florida has run a rationale and has determined that in areas with four septic tanks per acre, that is four houses per acre on septic tanks, one-third of the groundwater in Florida is water that is passed through a septic tank once. Now, you gentlemen need only to take a look how flat our ground is and imagine if we had one-third less water what we would have. We would have one-third sea water.

Now, I have heard here many comments about septic tanks, how bad they are. Yet our Florida State Board of Health records, which go back to 1898, do not show one case of disease due to septic tanks--not one.

Federal health records are even more elaborate and they too show not one case of disease due to septic tanks. Is this really due to poor record keeping? No, these same records show that in Salk polio vaccine for type 3 vaccine, in one case in a million,in adults,the vaccine causes paralysis. Exposure, perhaps? No, that isn't the case. Half of the people in the United States either live or work in a structure on a septic tank. Septic tanks really have a perfect health record.

Our problems with pollution in Dade County have occurred with the influx of sewage and the poor treatment of

K. Quina

sewage and the improper dumping and handling of sewage in the area. Much of the measuring or testing procedures that have been established have been established really to create sewerage systems for our State of Florida and they have been really based upon poor engineering analysis. Such test programs as pouring dye into a sink and pumping out of a well to prove that a septic tank pollutes. Gentlemen, that proves that a septic tank returns the water to the ground for reuse, that is all it proves. It does not necessarily prove that there is a health hazard.

Now, Ehlers and Steel, in their McGraw Hill publication Rural and Municipal Sanitation, state that it has been observed that in poor soils typhoid organisms would be washed down two feet, coliforms under the same condition would be washed down three to five feet.

Clark and Viessman in their Water Supply and Pollution Control state that the number of harmful organisms is reduced in passing through soil to tolerable levels by the percolation of water through six to seven feet.

Generally almost any sanitary or water treatment authority would agree that two feet of filter sand will remove 98 to 99 percent of all bacteria. So really what will four feet remove or six feet or eight feet or ten?

K. Quina

The Septic Tank Industry recently tested sprinkler wells here in Dade County. We tested 100 of them. Now, we did not test them to see if we had nutrients coming in our water. We tested them by taking a sample of water and running it through a millipore filter until we clogged the filter,putting the filter into a dish, incubating it for 24 hours at elevated temperatures and then counting for the number of blue colonies which indicate human fecal contamination, not something is rotten. These tests really prove that our sprinkler wells which were in the aquifer to which our septic tanks discharge were free of fecal contamination; they were 100 percent free.

Dade County really is not being polluted by septic tanks. These tests that showed dye returning, really all they show is septic tanks return water for reuse. This, gentlemen, is a plus factor, this is not a no-no, really.

Now, some of the other indications that have been used would be the testing of canals. I notice your own report is filled with the fact that our canals are very highly polluted in terms of an MPN test. These tests are beautiful tests. They show all sorts of exotic testing by students from the University of Miami, and I don't mean to downgrade them. I think they did an outstanding job. But really, if you will take a close look at them--and I visited each point in the canal system that is offered by the testing program that has been submitted to you--each point that shows a high E. coli count or a low oxygen count is either right at the outfall of a sewer and is not in existence a few hundred yards downstream from the sewer or is at a salinity dam or at a very fat part in the canal alike. What does this signify?

Gentlemen, this signifies, one, that you have at these points a large number of bacteria. Why? Well, fat parts of canals, salinity dams are places where debris settles. Where debris settles it ferments. You get the natural normal fermentation. You get there nutrients, you get there the bacteria that actually causes fermentation. And, really, all you have there is an indication something is rotten. I think it is the testing program.

Excuse me, I don't mean to belittle it, they did a fine job of putting together facts, but the facts don't mean anything. They compared the Everglades to our salinity dams. I went over and opened a well, a sprinkler well, along the 57th Avenue area by the Coral Gables Waterway Canal--a salinity dam there. I measured to the water table. Water table was about 2-1/2 feet below the canal level. Why? A salinity dam works, it holds back waters. It does, that is why it is put there. The groundwater was lower than the canal water. Our dam was functioning. It is doing a job of holding out salt water.

Now, in holding out salt water it is also holding the canal above the water table to which our septic tanks are discharging. Our septic tanks discharging to a lower water table can have no effect upon the water level in the canal system.

I think really that you have this same kind of test illustrated in the paper this morning. I don't know the details of it. I haven't had a chance to look at it, but apparently they were running MNP tests there too.

I have written Danny Fissell. He sent me a number of pieces of literature from the U. S. Coast & Geodetic Survey. Reports there indicate all over the country, in the New England States, in New York, the Carolinas, along the Gulf Coast, wherever coastal communities such as ours that are low-lying have abandoned septic tanks and replaced them with sewer systems whose outfall is aimed at dumping it in the ocean as quickly as possible, that they have also replaced not only the septic tanks but the groundwater supply. We have got really too many people and too little water in south Florida to take our water and just handle it in this poor manner.

Practically, I am not saying the septic tank is the total answer. I am not saying really that we should take everything and pump it in the Glades either. What we need in this area is a good, proper, unbiased Federal study by the U.S. Department of the Interior, such as the U.S.Coast & Geodetic Survey, that would outline for us a proper program for water usage, both sewage, septic tank and what have you.

Right now we are operating on a dart board basis. I think we have drawn maps of the State of Florida; we have thrown a few darts at it; and wherever they have landed we have acted accordingly. I feel it is poor planning, expeditious planning.

I have also heard threats here of"Let's stop building." I am a consulting engineer. I am very vitally interested in building. Two-thirds of our building permits in both Dade and Broward Counties last year were for buildings on septic tanks. Two-thirds, 62 percent of the building permits issued in Dade County last year were for permits on septic tanks. I think the health record of the septic tank speaks well for it.

There is no reason to ban septic tanks because of the health record or because of some pollution record or what have you based upon poor or improperly run studies. We are a billion dollar industry, the building industry of south Florida in just Dade and Broward, and to sewer these two counties, aside from the loss of our total water resources and probably the limitation of people, would mean a loss in terms of immediate building to our area of untold amounts of money and would mean really--it would wreck our economy.

I wish you would be very careful in weighing your actions, considering the facts. I would be glad to document anything I have here. I have tons of stuff at home. I have a few boxes out in the car. I didn't expect to speak this afternoon.

I am open to you, if I may answer any question you might have, sir.

MR. STEIN: Are there any comments or questions?

MR. REED: I think it has been amply proven, Mr. Quina, that the nutrient problem alone is so significant in Dade County, Broward County, and Palm Beach County that I just didn't think that anybody raised that question again. We all are obviously aware that the one thing that can be said for the septic tank is that it returns water to the groundwater table, but this is at the expense of every single canal in Dade County and every single canal in Broward County.

MR. QUINA: Mr. Reed, are you aware that the septic tank discharges into an aerobic filter bed and that in an aerobic filter bed much of your nutrients are consumed there?

MR. REED: I am very aware. Unfortunately I am on one, so I am very aware of the damned things. Thank God we live on such a large piece of land we don't have the problem, but when I see all these characters plugged in so many to the acre all on a septic tank, then I go--I don't--the research--we must read different research papers, I guess.

MR. THOMAN: I think so too.

Mr. Quina, 22 years ago I was one of the first three employees on the only research project that I have ever known to be conducted on septic tanks or concerning septic tanks, at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio, and we didn't find any reduction in bacteria through the tanks. If you had fecal bacteria come in, and fecal bacteria come from warm-blooded animals and they don't ferment in a canal or just suddenly appear there, they went through almost undiminished in quantity and quality. Some of the references that you cite from Ehlers and Steel, the last edition of Ehlers and Steel--not you, Bill--was published in the late 1930's, and the citation that you are reading is based on some work that was done by Public Health Service engineers around the turn of the century up in North Carolina; it was done in sandy soil, which is substantially different than the marl that exists in south Florida where you have interstices that any bug will go right through.

Now, that you do get any reduction in bacteria in the ground, I would not deny this; there undoubtedly is some. The little animals are out of their element and they do die. However, the blunt fact of the matter is that the septic tank at best is a horrible example of sewage treatment and is one that certainly has been discouraged by every authority any place in the world. You heard Dr. Hollis's report before, and I for one personally feel that you should be discouraged here in Florida.

I had a septic tank once too. It was a big one, about 2,000 gallons, and I sold the house before I had any trouble with it.

MR. STEIN: Do you want to comment?

MR. QUINA: If I might comment.

MR. STEIN: Sure.

MR. QUINA: Commenting upon the ground and its ability to remove bacteria, perhaps the classic example of the ground's ability to remove bacteria is the city of Miami's Alexander Orr plant. The well field for this plant lies along the Seaboard Airline railroad tract. Well after well after well after well, Snapper Creek Canal, Peninsula Utilities, sewage treatment plant, well after well after well. I have taken boats down that canal. Sometimes the canal flows both ways towards the treatment plant and the well field and to our drinking water supply. I don't believe our Alexander Orr supply is really polluted.

The entire flow from that treatment plant was being dumped in the canal to flow to the well field, but now I believe it is being pumped into the ground in the middle of it with a new discharge well and it is doing an effective--our soil is doing an effective job of removing bacteria.

Thank you.

MR. STEIN: Mr. Quina, the difficulty of speaking to a panel like this is that except for Mr. Reed here, who showed earlier his understanding of the problem, most of us came up through the ranks, and everyone is an expert here on septic tanks and privies. (Laughter.) And as you can tell, that is what we used to do in the old Public Health Service.

But you know, your statement about their putting the dyes down and finding it come up in the well reminds me of when I was a youngster I was sent out to Kentucky, and we got up there and they had these septic tanks and privies and wells. Of course, every spring they would flood. Being young and energetic we were appalled. When the flooding went down, I said, "Do you realize when this water subsides, it all gets mixed, and that septic tank and privy stuff gets in your well?" And this old Kentucky guy looked at that and he said, "Well," he said, "I guess that makes us all kinfolk, don't it?" (Laughter.)

MR. QUINA: In response to a septic tank failing on flooding, there was an article that appeared in Contractor Magazine last February that shows how to modify a septic tank to prevent failure of septic tanks under flood conditions. However, when a sewer floods, and there are more sewers and streets flooded than yards, your sewers flood, they go to a lift station and they pump out into the street and so our kids have something to play with. It is the same thing.

MR. STEIN: All right.

MR. QUINA: Thank you.

MR. STEIN: Thank you.

We will stand recessed until 9 o'clock tomorrow morning.

(Whereupon, at 5 o'clock an adjournment was taken until 9 o'clock, Wednesday, October 21, 1970.)

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MORNING SESSION

Wednesday, October 21, 1970

(9 o'clock)

MR. STEIN: Let's reconvene.

We will continue with the Florida presentation. Mr. Reed.

MR. REED: Is Mr. Leach here?

For the record, I have called him three times.

Let's see, then we go to Mr. Eugene Scott.

Eugene Scott?

All right. Dr. Grune?

Mrs. Perry?

Mrs. Evoy?

Perhaps people were confused by the 9 o'clock start, Murray.

MR. STEIN: Well, we will call them, go around again.

MR. REED: Mr. Taribo.

John, are you prepared?

MR. TARIBO: No, sir, I had the understanding that I would talk this afternoon.

MR. REED: Very well. We may move the General Waterworks presentation up, then, Mr. Stein, start off with them?

MR. STEIN: That would be just fine.

MR. REED: All right.

We will go ahead with Mr. Reynolds' allotted time.

Mr. Reynolds, is this working a hardship on you, moving you up?

MR. REYNOLDS: No, sir. That will be fine.

MR. REED: All right, instead of leading off at 10 with you, we will start off with you now.

And he had reserved one hour, to be followed by Mr. Bengochea for 50 minutes.

MR. STEIN: You know, Mr. Reed, this place is open for people who want to make statements, at least as open as appearing on television, and if they want to say something, they can come here and say it.

MR. REED: I recognize that.

Why don't we start off, and since there is some confusion as to what our starting hour was this morning, we will start off with Mr. Reynolds and give him our full attention for one hour for his report.

It is my understanding, Mr. Reynolds, you are going to go through this page by page, is that correct?

MR. REYNOLDS: Yes, sir.

MR. REED: All right. Just so I can follow you.

MR. REYNOLDS: So there isn't any confusion, I am just talking about the one that is labeled my statement. I don't intend to go through the other.

MR. REED: Yes, I understand.

MR. REYNOLDS: That may have been a bit of a shock yesterday when I unfolded both of those.

MR. REED: It was. (Laughter.)

C. L. REYNOLDS, VICE PRESIDENT
GENERAL WATERWORKS CORPORATION
MIAMI, FLORIDA

MR. REYNOLDS: We sincerely appreciate the action of the conferees in allowing us this time this morning. As I stated, we feel that we can make a contribution in the effort, I think, that is a common goal that we all share.

(The following statement was read:)

STATEMENT OF

C. L. REYNOLDS, VICE-PRESIDENT

GENERAL WATERWORKS CORPORATION

FEDERAL - STATE ENFORCEMENT CONFERENCE

October 20-22, 1970

Miami, Florida

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SECTION I

PREFACE

We wish to express our appreciation for this opportunity to address this Conference. We believe we can make a meaningful contribution to the efforts here in evaluating the local situation with respect to pollution enforcement and abatement.

General Waterworks takes pride in being a responsible corporate member of the community. It is hoped that our view point will be of value in considering this over-all problem.

We propose to address our statement to the experience that we have had with our various sewage facilities, existing and proposed. We believe our objectives are in concert with those of the community. Our goal is to provide sewage service to our customers with the full understanding of the need to protect the environment in which we all live

These statements will show the successful efforts of one corporation in overcoming the problems of keeping pace with community development while at the same time effectively controlling and reducing pollution. This will also show how a responsible corporation, acting entirely with private funds, can accomplish desired results.

SECTION 2

GENERAL WATERWORKS BACKGROUND INFORMATION

General Waterworks Corporation is a subsidiary of International Utilities Corporation. General Waterworks was incorporated in 1942.

It has since acquired controlling interest in, or owns entirely, approximately 80 water, sewer and heating subsidiaries. On March 1, 1968, General Waterworks became a wholly owned subsidiary of International Utilities Corporation.

Executive offices for General Waterworks are at 1500 Walnut Street, Philadelphia, Pennsylvania. Executive Officers of the Company are: Murray E. Stewart, President; L. R. Masotti, Vice President-Controller; and C. R. Morris, Vice President-Engineering and Operations.

At December 31, 1969, the Company served 324,000 water, sewer and heating customers. The utility systems are located in 18 states and one province of Canada. The Company is organized into 7 geographical divisions. Local operations are a part of the Southern Division, C. L. Reynolds, Division Manager; C. J. Fox, Division Engineer; and D. H. Moore, Division Controller. Division offices are located at 9555 North Kendall Drive, Miami, Florida. Operations of the Southern Division are located throughout the State of Florida and serve approximately 100,000 water and sewer customers.

Sewer operations in Dade County include the former Peninsula Utilities Corporation and the former Key Biscayne Water Company. These companies were merged into General Waterworks Corporation in February, 1970. Community Utilities Corporation, a subsidiary of General Waterworks, also provides sewer service in Dade County. More specific details of these operations are included in the following discussion.

SECTION 3

WHY PRIVATE UTILITIES IN THE FIRST PLACE?

For some time in particular, the last two years, there has been a great hue and cry against the investor-owned utilities in Dade County. The merits of this type of operation have been discussed in all types of forum by many different groups of people. One of the things that is rarely heard, amidst all this clamor, is the citizens of Dade County actually owe a great debt to the investor-owned utilities. They were established to provide service in a County that was growing by leaps and bounds at a time when the County itself could not and would not provide this service.

The County officials were content to allow the continuing development of the area as a septic tank community and had little to do with the planning of any sewage systems or treatment facilities at all. Credit for initiating the necessary requirements, which in turn influenced the growth of many investor-owned utilities goes to the Florida State Board of Health working in concert with the Federal Housing Authority. These agencies saw the need to provide adequate sewage treatment and would not approve the development of subdivisions on septic tanks.

The land developer then turned to the investor-owned utilities, or in some cases established his own utility company, in order to provide central sewage and water supply systems. Now that these investor-owned systems are firmly established, and some are approaching the point of providing an economical return to their owners, the County has decided that they must go. We feel that this entire approach to the problem is without merit and would deprive private enterprise of initiative and just rewards for its endeavor.

We will show, by several examples, that when the needs and the desires of the Community called for increased growth on the one hand and eliminating pollution on the other, that General Waterworks has been responsive to these needs. The Company has moved forward, raised the necessary capital, and accomplished meaningful pollution abatement results. The ability to raise capital and move ahead is a major advantage of the investor-owned utility. By its more flexible nature, private enterprise can move more rapidly in meeting the demands of today.

MR. REED: Mr. Reynolds, I am going to ask you not to read this part into the record. It cannot be part of this conference. We are not sitting here to go over the problems of condemnations, the problems of private utility versus community service. I think if we avoid this right now it would save us all a great deal of time, because we can't make a judgment on this, that is not our responsibility.

Let's go over to Section 5, the Dade County Master Plan, and get into your proposition on the well field, which I think is the main part of your presentation, because I think we are taking valuable time in discussing something that we have absolutely no control over.

MR. REYNOLDS: Mr. Reed, I appreciate your remarks, but I also point out that in the recommendations of the report which is filed by the Federal Government here there is further to that report as a part of its recommendation the construction of an areawide sewage collection, transmission and treatment facility.

MR. REED: But we didn't get into whether it would be privately owned or whether it would be owned by the county, and I think that has got to be left up to the locally elected officials and the county manager's office.

MR. REYNOLDS: Well, I would hope that my remarks here today would find ears in those authorities that you just mentioned that would be receptive to a reconsideration of some of the decisions that they have made.

MR. REED: Well, I haven't got the authority to say that you can't read this into the record. I think you have got a forum here that is not pertinent to this issue. We are not involved, we don't want to be involved, in whether the system is owned by the county or owned by private utilities.

But I think the key of this presentation is your discussions on the deep well field, which we are very interested in, or at least I am very interested in.

You may proceed as you see fit.

MR. REYNOLDS: I will accede to the wishes of the Chair in this matter and--

MR. STEIN: We will include this portion in the record as if read, though. But I must agree with Mr. Reed that it is beyond the authority of this forum to get into the question of whether a locality has a public or private utility. This is what I want to make clear.

Our concern is that the waters are protected and that proper treatment is provided to protect these waters and certainly that we don't deplete the water resources. I think, whatever our private judgment may be--and I don't know that we have any--we certainly have no public function in deciding how a water system or a sewer system should be run, whether it should be done by private utility or otherwise.

As you may know, in the New England States, for example, for historical reasons they have many more private utilities probably than others. We have worked with them as we have worked with public utilities. The question here is while we are very much interested in this, we can make no decision on it. As a matter of fact, it is beyond our authority to consider.

Why don't you proceed, Mr. Reynolds.

MR. REYNOLDS: Yes, sir. I shan't take the time of the conference, to which we are already indebted for this opportunity to talk.

(The following pages 431 and 432 are the omitted portions of the statement just referred to, which are included in the record as if read. Mr. Reynolds commenced reading again on page 433.)

SECTION 4

CONDEMNATION

In December, 1968, the County Manager of Dade County recommended to the County Commission that they proceed to acquire thru negotiation, or condemnation, if necessary, all private utility companies in Dade County. This recommendation was based on the County Manager's contention that only by this means could Dade County solve the existing pollution problem. The report of the County Manager to the Commission described various problems with respect to water pollution in Dade County. Then, without reference to any supporting data, or other reports, jumped to the conclusion that all these problems could be solved thru the County's acquisition of the various investor-owned utilities.

A representative of the former County Manager made an impassioned and biased presentation to the County Commission on January 7, 1969. His presentation included SLIDE ~~solid~~ projections showing operating conditions at various facilities. In my opinion as an Engineer, and based on my professional life spent in the water and sewer business, he used exaggeration, overly colorful language and other tactics to present the most distored picture possible to the County Commission.

At the conclusion of this presentation, one Commissioner moved that, without continuing the Public Hearing, or making any further studies, the County take the necessary steps to proceed with the acquisition of all private utility companies.

There were and are no reports or studies to indicate that this was or is the best, or even a practical solution to the pollution problem.

There was little discussion of the fact that Dade County had and has the police power to require enforcement of pollution control standards.

Why was this avenue not pursued in an effort to halt pollution? Why did the Commission jump to the hasty conclusion that the only salvation was through the elimination of private utility systems?

Our Company can show that we have extended every effort in the fight to control pollution in Dade County with respect to our service areas. It has been an uphill struggle, the combined forces of growth in the County and the press for ever increasing levels of treatment quality have made this a most arduous task.

Despite the action by the County Commission and the fact that on July 17, 1969, they entered suit to condemn all properties owned by General Waterworks Corporation, this Company has continued to discharge its responsibility to serve our customers and to be good corporate citizens of the community. The Company has proceeded with its programs to improve and upgrade facilities to meet the rapidly growing demands of today.

SECTION 5

DADE COUNTY MASTER PLAN

In 1961 Dade County prepared a Master Plan for Sanitary Sewerage. This plan contemplated the sewering of all of Dade County and the construction of major treatment works on the ocean and the bayfront to dispose of the effluent. The sewage was to be given various degrees of treatment depending upon whether the effluent was to be discharged to the Bay or the Ocean. This plan was very ambitious for its time and did provide a means to accomplish the end objective of sewering the County.

Little was done to implement anv feature of the Master Plan for a period of about six years. At that time, the County Manager took one of the first recommended steps and appointed a special assistant in charge of water and sewer affairs. Other steps necessary for the proper implementation of the plan, principally the vital step of preparing studies of fiscal matters and financing matters of and determining the additional taxation needed, have not been implemented.

So much time has passed, in fact, that the Master Plan is completely outdated. It can be noted on Page 50, for instance, the following contradictions. "The present pattern of sewage disposal, in much of the Metropolitan area, is a series of independent small systems discharging largely to canals and borrow pit lakes. A continuation of this practice would provide the lowest cost for sewage collection but would result in greater cost for treatment works, and their operation, than for a few large plants. The possibility of realizing savings on such smaller systems depends on the practicability of continued, increased sewage discharge to the inland waters." The report goes on to state "...there is no economically practical means available to remove surface active detergents from sewage." It should be noted that the County passed an ordinance prohibiting surface active detergents shortly after the Master Plan was completed so that this is no longer a factor.

It is necessary to take another look at the receiving waters available for sewage plant effluents other than surface canals. Reference is made here to the projected use of the "Boulder Zone" as receiving waters for treated sewage effluent. This concept has evolved subsequent to the preparation of the Master Plan. It should be recognized that the entire economics of sewage collection and treatment could be changed by this system and careful note should be made of the advantages that this system has to offer to the general public. These factors were not considered in the Master Plan because they were unknown at the time. It is safe to assume that these items would be seriously considered by any engineering report prepared today.

The Master Plan would also require updating with respect to the effluent standards now established by the State of Florida for treatment facilities discharging into the Atlantic Ocean. Many of the economic comparisons contained in the report were based on alternative methods of discharging to one point versus another. A major consideration in this factor was the degree of treatment required at different outfall locations. Since all of the requirements for degree of treatment have been changed in recent years these comparisons require a new analysis.

The authors of the Master Plan recognized that changes would be required in the future. On Page 65 it states, "....the Master Plan as actually implemented will inevitably differ in some respects from the arrangements and tentative details now defined. Various improvements in treatment methods are expected and will, from time to time, be incorporated in the Master Plan." It is strongly urged that these updating studies be made at the earliest possible time.

The Master Plan also suggests that the Administrative Agency of the County be permitted to provide wholesale sewage disposal service to municipalities or other owners of sewage collection systems. It was recognized that it was not an essential part of the Master Plan to acquire all municipal or investor-owned utilities. It is quite feasible to take an approach to the area-wide sewer problem which the Plan suggests.

This is shown in the contract between Dade County and Community Utilities Corporation. This contract provides for area-wide service through a County interceptor with the neighborhood collection system being constructed and managed by the investor-owned utility.

This method will accomplish the basic objectives of providing for a countywide system and eliminating discharges into surface canals. At the same time, the service to the retail customer will be provided through the investor-owned utility, the municipality, or the County. The amount of funds required to accomplish the job in this manner would be considerably less and it is also thought that the entire program could move ahead more rapidly. Funds otherwise required for acquisition purposes could then be available to extend systems into unserved areas.

General Waterworks strongly urges those in authority and responsible for these decisions to take another look at this philosophy before the commitment to a total program is so great as to preclude a change in course.

SECTION 6

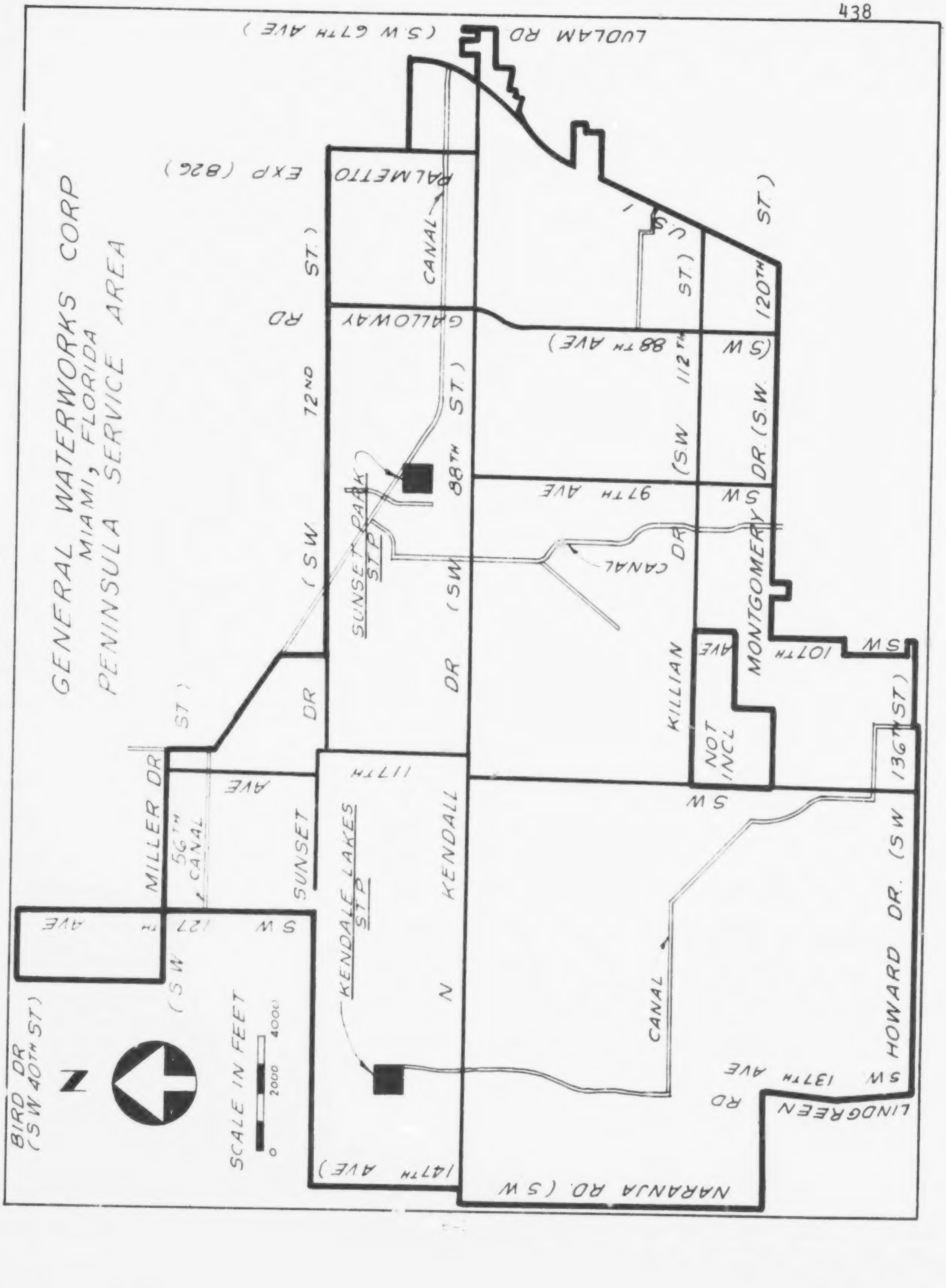
PENINSULA SERVICE AREA

General Waterworks Corporation started development of a water and sewer system to serve a large area in South Dade County in early 1960. The projected service area extends from Sunset Drive (SW 72 Street) on the North, to S W 136 Street on the South, and from approximately Ludlam Road (SW 67 Avenue) on the East, to S W 147 Avenue on the West. This service area is shown on Page 6-2.

The early projections for this area were based on a land planning study prepared by the Arvida Corporation, the major land owner in the area. The projected land use included a regional shopping center, some apartment areas, and the majority of the area devoted to single family homesites.

Beginning in 1963 many applications have been made for changes in zoning within this service area. These changes have had the effect of creating considerably higher population densities than was originally projected. Today there are extensive apartment developments extending from Ludlam Road to S W 117 Avenue along Kendall Drive. Much of this land was originally proposed for single family home development on standard lots with a density of 3 units per acre or less.

These changes in zoning, together with the accelerated growth of the area in the last several years, have made it very



GENERAL WATERWORKS CORP
MIAMI, FLORIDA
PENINSULA SERVICE AREA

LUDLAM RD (S.W. 67TH AVE)
PALMETTO EXP (826)
CANAL
GALLOWAY RD (SW 88TH AVE)
U.S. 1
SW 72ND ST.)
SUNSET DR (SW 88TH ST.)
SW 112TH ST.)
SW 120TH ST.)
SW 97TH AVE
SUNSET PARK STP
CANAL
KILLIAN DR
MONTGOMERY DR (S.W.
SW 107TH AVE
NOT INCL
SW 136TH ST.)
MILLER DR (SW 56TH ST.)
56TH CANAL
SW 117TH AVE
KENDALL DR
SW 127TH AVE
KENDALE LAKES STP
CANAL
HOWARD DR. (SW
SW 137TH AVE
LINDGREEN RD
SW 147TH AVE
NARANJA RD. (SW
BIRD DR (SW 40TH ST)
N
SCALE IN FEET
0
2000
4000

difficult for the Company to keep abreast of the requirements for sewage treatment. Despite a nearly continuous construction program since 1967, there have been times when the capacity for sewage treatment fell behind the requirements of the moment.

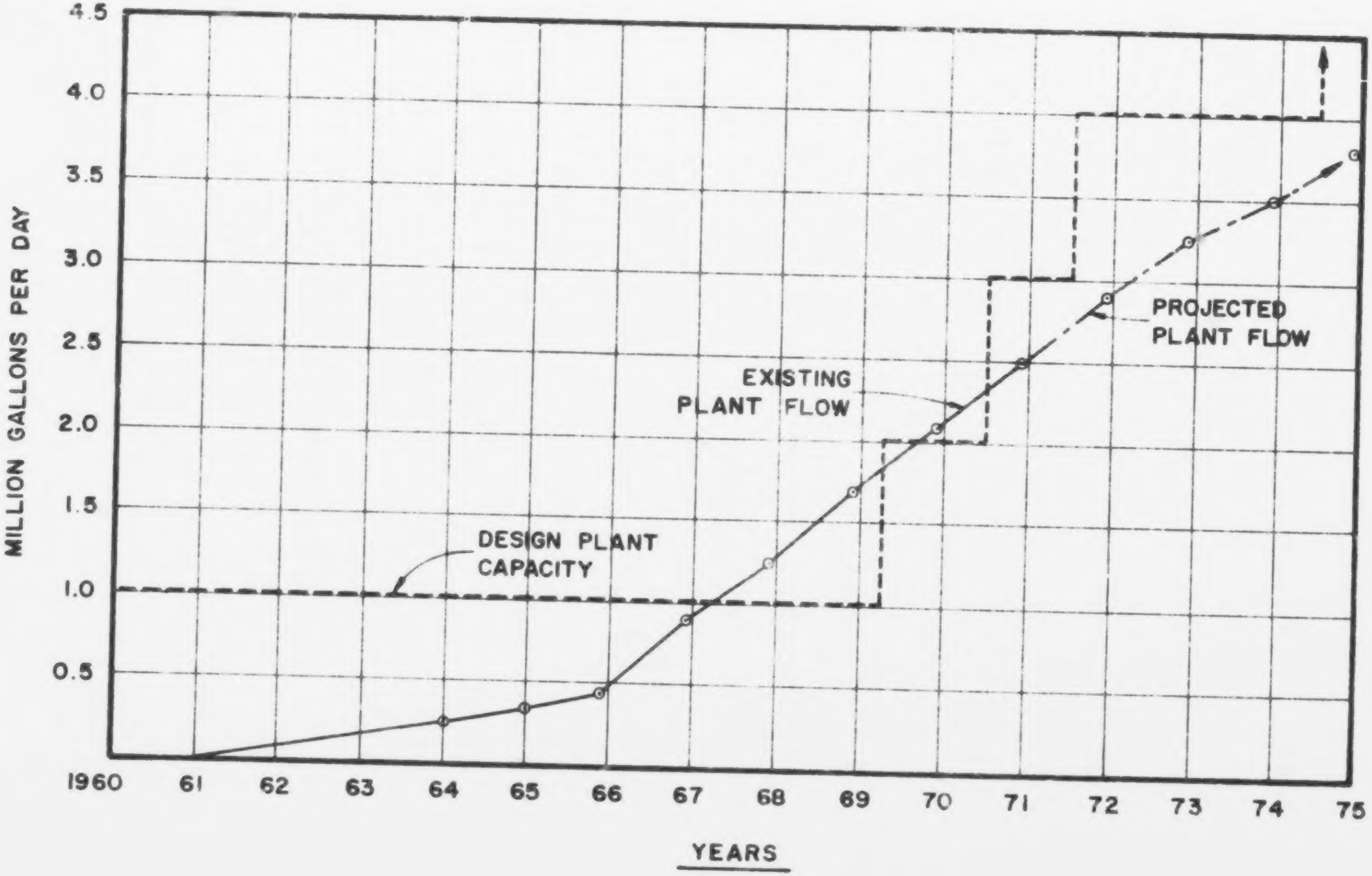
A comparison of the growth in the area, as reflected by plant flow, versus the treatment plant capacity is shown on the graph on Page 6-4. The future projection for additional growth and the need for additional treatment facilities is also shown.

The active customers in this system, by classification, on September 30, 1970, are tabulated below:

Sewer - Residential	3,345
Sewer - Commercial	439
Sewer - Other	17
Total	3,801

The area is served by 46 miles of gravity collection sewer mains and 3.5 miles of gravity trunk mains. The system also contains 11.3 miles of pressure mains and 20 pumping stations.

SNAPPER CREEK PARK
WASTEWATER TREATMENT FACILITIES



SECTION 7

PENINSULA SEWAGE TREATMENT PLANT

The original sewage treatment plant for the Peninsula service area was constructed at S W 97 Avenue and 83 Street. **For identification with the government's report, it is referred to in there as the Snapper Creek Park Subdivision plant.** The plant was constructed in 1960 with the first units being placed into service in July of that year. The plant was designed with an initial capacity of 1.0 MGD (million gallons per day) with provisions for later expansion to a capacity of 4.0 MGD. The plant was designed by the firm of Hart-Reynolds and Associates, Inc., Consulting Engineers, Coral Gables, Florida.

The plant utilized the conventional activated sludge treatment process. It contained the following treatment units: sewage pumping station, primary clarifiers, aeration tanks, secondary clarifiers, chlorine contact tank and anaerobic sludge digester and sludge drying beds.

This design was the most advanced form of sewage treatment in general use at that time. The projected efficiencies were 90% B.O.D. removal and 85% suspended solids removal. Plant effluent is discharged into Snapper Creek Canal, a part of the drainage system constructed by the Central and Southern Florida Flood Control District.

When this plant was placed into operation, the initial service area consisted of a few single family residences and later the regional shopping center at Dadeland. During the period of 1960 to 1966 the average daily plant flow increased from 0 to 0.5 MGD. As a result of the increase in building construction and the many changes in zoning from single family to multi-family construction, the plant flow increased approximately so much in a single year (1966 to 1967) as it had in the more than 5 years prior to that time. This change in rate of growth is shown on Page 6-4.

In 1967 additional treatment plant facilities were designed by Ray L. Hart & Associates, Inc., Consulting Engineers. These facilities were to provide additional treatment capacity and also reflected changes in the state of the art which had occurred since 1960. The basic treatment process was changed from the conventional activated sludge process to contact stabilization. The contact stabilization process is more favorable because it is more resistant to changes in hydraulic flow rates and provides an equal, if not superior, level of treatment efficiency. Additionally, the development of aerobic digesters had taken place during this period of time. These are more efficient than the traditional anaerobic digesters. They lead to better digestion of the excess sewage solids in the treatment system. They are simpler to control, and they are less prone to produce odor nuisances. Facilities were designed to provide for this conversion in process and to expand the plant capacity to 2.0 MGD

In retrospect, it appears that a decision at that time to construct a plant of greater capacity would have had considerable merit. The decision setting the plant capacity at 2.0 MGD was made on the basis of several factors. These included the consideration of the slow rate of growth in the system in the years preceding 1965 and the possibility of another slow-down in building such as occurred in 1963. Exactly the opposite actually occurred. The rate of growth accelerate in this service area as they did throughout the County.

The Engineers submitted a preliminary report to the State Board of Health, which then had jurisdiction over all sewage treatment plant construction and operation. It was determined by that Agency that a treatment process had to be designed which would not add additional biological loading to the receiving stream. The original plant had been designed for a capacity of 1.0 MGD at a 90% removal efficiency, resulting approval to discharge 167 pounds of B.O.D. per day. It was determined that this quantity of B.O.D. discharge to the stream could not be exceeded in further plant expansions. This meant that to expand the plant to 2.0 MGD would require a plant design which provided a 95% B.O.D. removal efficiency. At that time, primary emphasis on plant evaluation was based on its ability to remove B.O.D. or biochemical oxygen demand.

As we look at this problem in 1970, we know of several advanced treatment methods which can meet these criteria. In fact, many of these processes being utilized today can produce effluent of even higher quality standards. At that time in 1967, however, this was a new concept in the state of the art. There were only a few experimental pilot plants which had been constructed and were in operation which could produce effluent that approached this quality. The Design Engineers were, therefore, required to examine these experimental processes and select the one which seemed to be the most applicable.

After considerable examination of the problem and research into the various systems that were then commercially available, the

Engineers selected a system which consisted of pressure filters containing mixed media. This media consisted of various sizes of sand and gravel of different specific gravities. This produces a filter bed which can retain the activated sludge floc particles which escape from the final clarification tanks. The principal involved in this system was to reduce the plant effluent suspended solids by trapping these particles, thereby reducing the B.O.D. contained in the effluent.

This system, while it provided the desired degree of treatment, was cumbersome and contained many undesirable features. The system required additional tanks and pumps for back washing purposes. These added to the complexity of the overall treatment process and introduced an area of uncertainty as to the overall process. The fact that the process itself was not well established was borne out by discussions with the company proposing to supply the equipment. The design criteria was changed at several points during the process of refining the design for this facility. A complete design was prepared for this system of treatment and construction drawings were finalized and forwarded to the Florida State Board of Health for their approval.

Due to the length of time required to evaluate the more sophisticated treatment systems and develop a final design, the decision was made in the Fall of 1967 to submit the treatment process in two distinct construction packages. The first phase of this construction consisted of the more conventional secondary treatment process for which design parameters were known and established and on which work could proceed. It was planned to submit the filtration system, or tertiary system, at a later date.

It should be noted that the review and approval of the secondary treatment facilities was considerably impaired and delayed by the Dade County authorities. As a part of their review, the Florida State Board of Health had requested a statement from the County Manager as to the status of this particular sewage treatment facility with respect to Dade County's plans to implement their overall sewerage system. This letter was written to County Manager and went unanswered for several months. It was finally only at the pleading of the Company that the State Board of Health agreed to process our plans so that construction could get under way. The existing treatment facility was then operating in an overloaded condition as can be noted on the graphs of sewage quantities at this plant.

To minimize the construction time required, the Company obtained advance approval from the State Board of Health and proceeded to order equipment required for the treatment plant expansion. This was done because the delivery of equipment was the controlling time factor which would dictate when the completed facility could be placed in operation.

The Company then requested bids for construction of the facilities upon receipt of the Board of Health approval dated March 31, 1968. Much to the dismay of the Company, only one Contractor responded to the invitation to bid. The price bid was greatly in excess of the Engineer's estimate and the funds available for construction. The Company then elected to act as its own prime contractor and obtain the services of several subcontractors to perform the structural, electrical and mechanical work necessary to build the plant. Construction of the facilities was commenced in April, 1968 and the critical treatment units were placed in operation at the beginning of 1969.

During the interval between the submission of the tertiary treatment facility and the approval of the secondary treatment units, the Company learned of a technique for disposal of sewage effluent by discharge into the "Boulder Zone" by means of a deep disposal well. This project was researched and selected for construction in lieu of the tertiary plant facilities. This project is discussed in full in another portion of this report.

A new method of treatment was introduced in the design of this phase of expansion which proved later to be inapplicable to this facility. This unit consisted of settling tubes fabricated of plastic material and designed to improve the settling in the final clarifiers. The manufacturer of this equipment had represented to our Design Engineers that the capacity of the existing clarifiers could be increased 100%, that is, from 1.0 MGD to 2.0 MGD, by the use of these settling tubes. This facility was the first large scale installation of these tubes in a rectangular clarifying basin. Our experience with the equipment proved that there was still much to learn about the proper application of this method.

The units were unable to cope with the hydraulic characteristics in the settling basins. These units never did operate up to their expected levels. As a result, the plant effluent quality was very poor from the point at which they were installed until the new clarifiers, which were a part of the expansion of 3.0 MGD, were completed in June of this year. This experience with the settling tubes has been most regrettable in terms of the Company's inability to provide proper treatment for an extended period of time. The equipment was purchased in good faith and the manufacturer represented it as a proven principal. In the final analysis, the product was so new that there were many features of it which were not understood at the time the equipment was manufactured and sold. This experience further indicates the pitfalls into which we are likely to fall in a period such as this. The state of the art of sewage treatment is rapidly changing and people in all phases of pollution abatement are seeking better ways and more efficient ways to accomplish the desired end results.

In this instance, the expansion of the plant capacity using conventional construction would have considerably reduced the suspended solids content in the plant effluent during 1969 and early 1970. As it was, the effluent was of poor quality due to the ineffectiveness of the settling tubes until approximately 4 months ago when new larger capacity clarifiers were placed in service.

On the chart of sewage plant flows, it can be seen that the treatment facility was actually approaching its design capacity of 2.0 MGD by the time the completion of construction on the expansion to that capacity was completed. It was, therefore, necessary for the Company to proceed immediately with plans to expand the facility to 3.0 MGD and to have this work ready to commence in almost continuous construction program. The plans for this expansion were submitted to the Board of Health on September 2, 1969 and the contract was awarded for the construction on October 2, 1970. Again, the Company had placed equipment orders prior to the award of the construction contract in an effort to save time and keep pace with the needs of the facility. In the expansion to 3.0 MGD, there were no changes proposed in the basic treatment process. That is to say, the contact stabilization process was retained. It had been learned, however, that the preponderance of opinion indicated a preference for circular secondary clarifiers over rectangular ones. The former being more efficient than the latter. Therefore, in the design of this expansion, the Engineers provided for the construction of two circular clarifiers with a capacity of 2 MGD each, or a combined capacity of 4 MGD. Additional facilities required in this expansion included additional digester capacity and a considerable amount of construction related to changing the hydraulic flow pattern of the existing clarifiers to the new ones. The original rectangular clarifiers were converted to a chlorine contact basin to provide for greater chlorine contact detention time. The original chlorine contact tank was converted into a sump for use with the pumps required for operation of the disposal well.

The first of the new clarifiers was placed into service on May 15, 1970, and the second on June 5, 1970. Work is nearing completion on the new digester and finishing up the total construction project. This work is now expected to be completed by October 28, 1970.

Growth in the area is currently continuing at a rate of approximately 400,000 to 500,000 gallons per day per year, an additional expansion of the plant to 4.0 MGD capacity is now being designed by the Consulting Engineers. The land area served by this facility is becoming more built-up. It is anticipated that the annual growth rate will be reduced, reflecting this approach to saturation, and the expansion to 4.0 MGD will provide for the needs of the service area for several years to come.

The current treatment design provides for 90% removal of B.O.D. and 85% removal of suspended solids. It is proposed that all effluent from this plant will be pumped via the deep disposal well into the "Boulder Zone". The Engineering Report has been prepared for this facility expansion and submitted to the Dade

County Pollution Control Department for their review. It is anticipated that upon reaching a concurrence of the design of this facility, the engineering plans and specifications can be completed before the years' end and that construction can commence early in 1971.

MR. REYNOLDS: Mr. Chairman, I have done a section on the deep disposal well. Having Dr. Garcia-Bengochea with me here today who is going to submit that in full, I would like to submit that this be included in the record as if read.

MR. REED: Granted.

MR. THOMAN: It will be included in the record as if read.

(The omitted portion referred to is on pages 452 to 457. Mr. Reynolds commenced reading again on page 458.)

SECTION 8

DEEP DISPOSAL WELL

Even as plans were being prepared for the construction of pressure filters to reduce the organic solids in the effluent at the Snapper Creek Park Treatment Plant, the Company and its engineers were not satisfied that this would be the best solution to this problem. The data on this system indicated that it would remove 97% to 98% of the B.O.D. received at the plant. Based on the then existing criteria (that the organic load to the stream could not exceed that which was projected for the one million gallon per day plant with 90% removal) it was apparent that the system of filters under consideration would only permit the expansion of the facility to 4.0 million gallons per day. At this time, early 1969, revised ultimate growth figures indicated an ultimate capacity requirement for this facility of 6.0 mgd. The system under consideration was, therefore, inadequate for the projected needs and some alternative means had to be found. It should be further noted that the criteria then being discussed for possible future use would require the removal of nutrients, either phosphates or nitrates, or perhaps both at some point in the future. It was evident that the cost of these facilities would be greatly magnified to meet these future requirements.

During this period it came to the Company's attention that the South Florida peninsula has a unique geologic formation. It was learned that there is a very permeable zone at a depth of from 2500 to 3000 feet, perhaps extending as far as 3500 feet, which contains natural water, is highly saline and unfit for human use.

It was also learned that a well had been constructed into this formation in Belle Glade, Florida, and had been in operation at that time for approximately two years. This well is used to dispose of an industrial waste high in organic content and do it safely without detriment to the fresh water resources of the area. Contact was made with the Consulting Engineering firm of Black, Crow and Eidsness, Inc., Gainesville, Florida who had designed the deep well at Belle Glade. In conference with Dr. J.I. Garcia-Bengochea and Dr. F. A. Eidsness, it was learned that the disposal zone used at Belle Glade extended under the entire Southern Peninsula of Florida and there was little doubt that it existed in the Dade County area. The Engineers were most encouraging in their estimation that this was indeed a proper solution to our effluent disposal problem. This conclusion was reached based on the following:

1. The Snapper Creek Canal had obvious limitations as to its ability to receive additional plant effluent. This is compounded by the fact that other sewage treatment facilities also discharge into this waterway.

2. Plans for implementation of the County Master Plan, which anticipates the eventual abandonment of neighborhood treatment facilities such as the Snapper Creek Park Plant, was far behind schedule and it was concluded that it could not be implemented in time to permit the orderly development of the service area.

3. While the estimated cost of the well and pumping facilities was slightly higher than the pressure filtration system

under consideration at that time, it would probably have a greater capacity and if it proved successful would eliminate any need to consider nutrient removal in the future. Thus the ultimate savings to the customers of the Company in the service area would be considerable.

Preliminary conferences were held with Mr. Ralph H. Baker Jr., Director of Division Waste Water, Bureau of Sanitary Engineering, Florida State Board of Health, and Mr. Paul W. Leach, Director of the Dade County Pollution Control Department. After due consideration, both agencies indicated that a deep disposal well in this area would be considered. The Company then authorized the Engineers to prepare a detailed report for submission to the regulatory agencies. Final approval of the construction features was obtained from the State Board of Health on October 28, 1968 and the Dade County Pollution Control Department on March 6, 1969. Prior to the approvals mentioned, this matter was considered by all Divisions of the Florida State Board of Health, which was the approving agency at that time.

Plans and Specifications were prepared by Black, Crow and Eidsness, for the construction of a disposal well to an estimated depth of 2500 feet. It was expected to encounter the very permeable and salty limestone aquifer referred to as the "Boulder Zone" at approximately that depth. It was anticipated that the Boulder Zone could accept the volume of waste to be discharged at reasonable pressures. The well was designed to prevent any contamination of the upper aquifer either by waters from the Boulder Zone or from the effluent discharged into it.

The Biscayne aquifer, from which the water supply of Miami is obtained, extends to a depth of approximately 100 feet. It is separated from the Floridan aquifer by an aquiclude by approximately 800 feet thick. Water in the Floridan aquifer is brackish and is penetrated by 5 to 10 wells in the Miami area. An aquiclude extending from a depth of 1800 to 2550 feet separates the Floridan acquifer from the Boulder Zone. The Boulder Zone is a highly cavernous formation with very large horizontal transmissabilities. Comparison shows that the chemical composition of the water from the disposal well is practically the same as that from sea water in the Atlantic Ocean at Miami Beach. The Boulder Zone ultimately discharges into the ocean depths of the straits of Florida. Thus, it is seen that the deep disposal well is, for all intents and purposes, a natural ocean outfall which can accept sewage effluent at the sewage treatment plant site and ultimately discharge it into the depths of the ocean.

The completed disposal well extends into the Boulder Zone to a depth of 2,947 feet. It is separated from the Biscayne and Floridan aquifers by cemented steel casings to prevent pollution of the upper formations. Two aquicludes, comprising a total depth of approximately 1500 feet, separate the receiving stratum from the Biscayne aquifer. The well is designed and constructed with an annular space between the inner and middle casings extending from the Floridan aquifer up to the land surface. This design permits a constant flow of water from the Floridan aquifer, which is under artesian pressure, to be delivered at ground surface level. Monitoring devices will be installed to provide a constant check of this water for any change in its specific conductance. By this means it will be possible to determine if there is any failure of the well casing or the cementing separating the Boulder Zone from the Floridan aquifer. If such a failure should be shown by the monitoring equipment, the well will automatically be shut down and repaired with the plant flow being diverted to Snapper Creek Canal temporarily. Secondary sewage treatment facilities will be retained in service to provide 90% B.O.D. reduction and 85% suspended solids reduction of all waste prior to injection into the well.

Flow tests to evaluate the Boulder Zone's ability to receive effluent in quantity were conducted in January, 1970. These tests indicated that at a pumping rate of approximately 4,000 gallons per minute, the Boulder Zone could receive this material at an increase in pressure over static conditions of only 1.7 pounds per square inch. This test shows that the design quantities of effluent can be safely disposed of into the Boulder Zone. A continuous monitoring program on pressures at the well will be maintained.

The deep disposal well is completed and is ready for service. Pumping and monitoring equipment has been ordered and will be installed later this year anticipating that all will be ready to place the well in service in January, 1971.

The Company believes the deep disposal well offers a safe economical solution to the problem of disposing of treated plant effluent. The use of similar wells on an areawide basis would eliminate the need for expensive interceptor systems throughout the County and provide sewage service to the citizens at reasonable rates. It should also be noted that the treated plant effluent injected into the Boulder Zone is predicted to remain as a discreet bubble of fresh water due to the extreme difference in salinity between the plant effluent and the natural ground waters at that depth. This then leads to the possibility of providing an underground storage reservoir of fresh water which can be tapped at some time in the future,should the need for fresh water at that time indicate the desirability of doing so. Water removed from the underground reservoir could be usable to man with little further treatment. This would avoid the consumptive use of our fresh water resources which is the case when treatment plant effluent is discharged into the ocean.

We submit with this statement and request that it be included in the record, the Consulting Engineer's "Engineering Report on Drilling and Testing of Deep Disposal Well for Peninsula Utilities Corporation", prepared by Black, Crow and Eidsness, Inc. Dr. J. I. Garcia-Bengochea, Engineer-in-Charge of this project is here today. We request that he be allowed to make a further statement to this Conference following the completion of this statement.

SECTION 9

PENINSULA - KENDALE LAKES PLANT

In 1968 a land developer contacted General Waterworks to discuss service to an area in Section 34-54-39. The Developer proposed to develop this section of land with 3,000 apartment units, 1,000 homes and a regional shopping center. He required water and sewage facilities to serve this development.

This location, at approximately S. W. 137 Avenue and North Kendall Drive is approximately 4.0 miles West of the Company's Snapper Creek Plant. A study was made of the economics of construction of one large central plant facility and long transmission main compared to a separate plant facility with more limited collection systems. This study indicated a separate treatment facility would be the most feasible means of serving Kendale Lakes. It is anticipated that other land in the vicinity will be developed in the future and can be served by the Kendale Lakes facility.

The developer's proposed rate of construction indicated that a plant capacity of approximately 250,000 gallons per day would provide service for some two years into the development. A first plant was designed with that capacity and plans were submitted to the agencies for approval. During this review period,it was determined that treatment removal efficiencies in excess of 90% of B.O.D. would be required. It was necessary to abandon the plans as originally submitted. The developer,meanwhile,indicated an acceleration of his development plans.

To accommodate these requirements the Company had plans prepared for a 500,000 gallon per day sewage treatment facility. This plan was designed to accommodate micro-screening equipment to produce a final effluent with a 95% B.O.D. reduction capability. These plans were subsequently approved by the Dade County Pollution Control Department and the Florida State Board of Health. Plant equipment was ordered in June, 1969, and construction of the project was completed and the plant made ready for service last week. Cost for this facility to date is in excess of $210,000.

As had been anticipated, there are additional developments taking place in this general area. The projections of future requirements at this facility now place the ultimate plant capacity required at this location at approximately 10 million gallons per day. Engineering has commenced for the first phase of this ultimate treatment facility which will have an initial capacity of 2.25 million gallons per day. It is anticipated that the engineering drawings for this project will be completed and the project approved by the agencies in time to request bids for construction of the project later this year and commence construction in January, 1971. This facility will be designed and constructed to provide a maximum of 10 parts per million B.O.D. and 10 parts per million suspended solids in the final effluent. There will also be provisions for adding coagulents in the aeration basin to reduce the phosphate levels. A test procedure will be established to determine the effectiveness of this method of treatment for phosphates.

The initial effluent discharged from this plant will go to a surface drainage canal system. It is proposed to construct a dam across the canal upstream of the point of discharge to prevent any backflow into the Kendale Lakes area. There is an extensive lake system in this subdivision with waterfront homes. It has been deemed desirable to avoid any possible deterioration of the water quality as a result of effluent discharge into the canal.

Upon receipt of sufficient operating data and evaluation of the deep disposal well at Snapper Creek Plant it is anticipated that this method will prove to be the most effective and satisfactory means of final effluent disposal at the Kendale Lakes Plant as well. As is our objective in all sewerage facilities, General Waterworks is striving for zero pollution with the Kendale Lakes Plant.

SECTION 10

BACKGROUND - COMMUNITY UTILITIES CORPORATION

Community Utilities Corporation is an investor-owned water and sewer company serving a portion of the unincorporated areas in Southwest Dade County. This service area is shown on the accompanying sketch. This Company was founded in 1954 by a land owner-developer having an interest in many parcels of land in the area. In order to develop his land holdings, this individual found it necessary to enter the water and sewer business.

In 1954 approvals were received to construct a water supply and distribution system, a sewage collection system, and a sewage treatment plant designed to serve approximately one thousand lots. We will deal only with aspects relating to the sanitary sewer system.

General Waterworks purchased the stock of Community Utilities Corporation in January, 1969. Considerable effort and money has been spent since that acquisition to improve these sewerage facilities. These efforts will be described in the following testimony.

SECTION 11

COMMUNITY UTILITIES SERVICE AREA

Community Utilities serves an area known as the Westchester area of the unincorporated section of Dade County. The original area was, for the most part, devoted to residential construction.

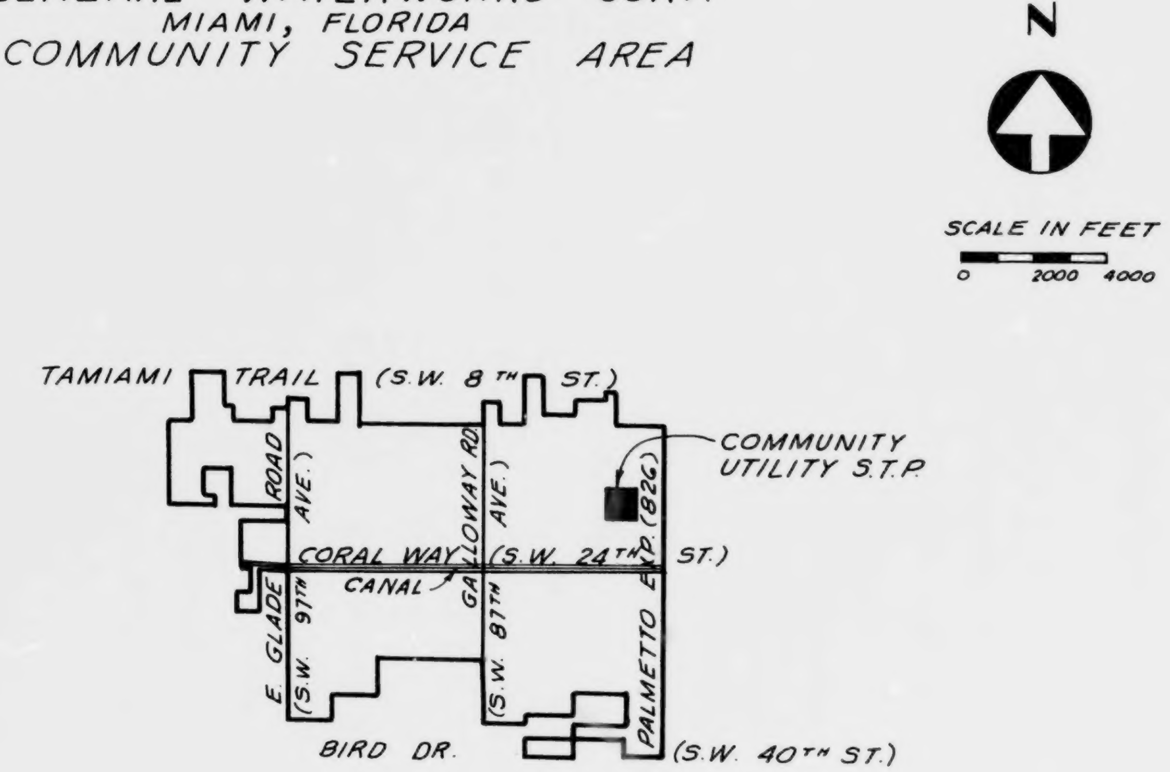
The service area is generally bound on the North by S. W. 8 Street, on the East by the Palmetto Expressway, on the South by S. W. 40 Street and on the West by S. W. 102 Place. Much of this area has, like many others, been re-zoned for multi-family units and commercial developments. It is anticipated that this rezoning will have a significant effect on future growth of this system. **The** service area is shown on Page 11-2.

The active customers, by classification, on September 30, 1970, are tabulated below:

Sewer - residential	5,636
Sewer - commercial	277
Sewer - other	5
Total	5,918

The area is served by 47.2 miles of gravity collection sewer mains and 1.8 miles of gravity trunk mains. The system is completed with 2.4 miles of pressure mains and 17 pumping stations.

GENERAL WATERWORKS CORP.
MIAMI, FLORIDA
COMMUNITY SERVICE AREA


N
SCALE IN FEET
0
2000
4000
TAMIAMI TRAIL (S.W. 8TH ST.)
COMMUNITY UTILITY S.T.P.
ROAD
(S.W. 97TH AVE.)
E. GLADE
GALLOWAY RD.
(S.W. 87TH AVE.)
CORAL WAY (S.W. 24TH ST.)
CANAL
PALMETTO EXP. (826)
BIRD DR.
(S.W. 40TH ST.)

SECTION 12

COMMUNITY UTILITIES SEWAGE TREATMENT PLANT

The original Community Utilities Sewage Treatment Plant was approved by the Florida State Board of Health under their Serial Number 1335-A, dated May 25, 1954. This original approval, and subsequent approvals made shortly thereafter, permitted the connection of the equivalent of 1,082 residences. The first phase of construction involved a treatment plant utilizing the conventional, mechanically-aerated, activated sludge process. This 0.38 MGD plant was placed in service in November, 1954.

Shortly thereafter, a second phase of construction increased the plant's capacity to 1.05 MGD. This addition was placed in service in late 1956.

A 1.0 MGD addition to the plant, also using the activated sludge process, was completed and placed in service November, 1960. An analysis of the operating reports for the ensuing years (1961-1966) indicated that the plant performed as designed as to B.O.D. removal. However, its efficiencies in removing solids did not meet established criteria.

In 1966, Company studies showed that the plant was subjected to a hydraulic overload due to excessive ground water infiltration in the system. Both B.O.D. and solid removals deteriorated. The Company embarked on an infiltration "search and repair program" which provided only limited improvement.

In the period from 1966 through 1968 little or no work was performed to solve the basic problem. The Company was at odds with both the local regulatory agencies and the Florida State Board of Health. The Board of Health required, as they had in the case of other plants, that no increase in capacity would be approved without an increase in plant efficiency, thereby limiting the biological loading to the stream to previously approved levels. The owners of the Company at that time either could not, or would not, make the additional investments necessary to upgrade the plant efficiency.

On January 3, 1969 General Waterworks acquired Community Utilities Corporation. Immediately, plans were initiated to alleviate and solve the problems. In fact, preliminary engineering work was underway prior to the actual closing on the property. An initial expenditure of $45,400 was made toward plant improvements. This work consisted of providing supplemental aeration equipment, cleaning and repairing the separate sludge digesters and improving the chlorination equipment. Although this work was badly needed at that time, it did little to improve the overall plant efficiency.

While this work was underway, engineering was completed and approval obtained for major items of work on this plant. The plant had three principal faults at that time: there was insufficient aeration of the mixed liquor solids, there was poor settling in the final clarifiers and the activated sludge return piping system was practically impossible to operate. This project was undertaken to correct these basic faults. The cost of this work was $116,800.00. It was placed in service in December, 1969.

The increase in the plant's ability to retain suspended solids in the process, which resulted from the aforementioned improvements, was reflected in improved process efficiencies. Additionally, the new reinforcement to the aeration capability provided means to maintain dissolved oxygen throughout the system which had previously not been possible. As the plant began to treat sewage properly, the activated sludge inventory within the plant began to increase rapidly. It was soon evident that the existing sludge digestion system had insufficient capacity for this increased solids loading. There was a short period of time in which the activated sludge solids were escaping the plant in quantities approaching conditions that existed prior to the construction of the improvements.

At the same time, there was an upset condition in the anerobic digesters which made it impossible to put additional loading on them until that process could be restored to a proper operating condition. A program of sludge hauling by commercial vehicles was commenced in early February, 1970. This sludge was transported to the City of Miami Treatment Facility on Virginia Key where they have provisions to receive the pump-out from septic tank installations.

This program was originally conceived as a means of alleviating this problem until such time as the anerobic system could be re-established. Continuing difficulties in obtaining a proper operation of these digesters, which continue to date, has resulted in a continuous operation of the sludge transport system. Our records indicate that we have hauled in excess of 4.1 million gallons of sludge to date at a cost to the Company of approximately $72,000.00.

By the use of this system excellent operating results have been obtained and are continuing. For the year 1970, B.O.D. removals have averaged approximately 95% and the removal of suspended solids has averaged in excess of 90%. In both of these measures, the plant effluent exceeds that normally expected from this type of basic treatment process. Plant operating records for the past three months indicated that the B.O.D. in the plant effluent was one-third of the amount originally designed for and approved.

General Waterworks is proud of the improvement in plant effluent being discharged since the acquisition of this system. This is shown in the following tabulation:

Average B.O.D. removal Jan.-June,1969	80%
Average B.O.D. removal July-Dec.,1969	79%
Average B.O.D. removal Jan.-June, 1970	94.5%
Average B.O.D. removal July-Aug., 1970	95.4%

Removal of suspended solids has averaged in excess of 90% in 1970. Operating conditions prior to the transfer of ownership were similar to those shown for the first period above.

Evidence of the increased ability of the plant is shown by recent inspection reports of the Dade County Pollution Control Department. In a report of inspection made on Tuesday,March 3, 1970, by Robert E. Evans the following was noted: "Both of the plants were producing a very high visual quality of effluent free of solids. This is the best effluent that has been observed at this plant since inspections by this office had been made". (Reference to "both of the plants" refers to the physical layout of the facilities). In a report, dated March 6th, Mr. Evans stated "the effluent from the South plant was beautifully clear ...this plant has gone a long way in the treatment process from producing one of the worse effluent to producing one of the best effluent. As criticism is rightfully given when a sewage treatment plant is not performing to is acceptable level, praise of the well operating plant should be given both to Community Utilities and, especially, to the operators of this treatment plant facility. They take great pride in doing a good job, both in producing a high quality effluent and of protecting our environment."

SECTION 13

COMMUNITY UTILITIES RECEIVING STREAM

At the time of acquisition of the Community Utilities sewage treatment plant, an inspection of the tributary canal to the Coral Gables Waterway, which receives the effluent from this plant, showed it to be in evident distress. The water in the canal was dark in color, there were signs of gas bubbles surfacing all over the canal, and there were many particles of material floating on the surface. This material was identified as the product of decomposition of biologically active material on the canal bottom. Through the decomposition of this material, gas bubbles are formed which attach to the matter. When the gas bubbles become sufficiently numerous they cause material to rise to the surface. These conditions indicated that the canal was septic. There was no fish life in evidence.

These conditions were created by the carry-over of activated sludge particles which escaped from the final settling tank of the treatment plant. This condition apparently existed during the entire life of this facility. It was previously noted that one of the items in the improvement program undertaken by General Waterworks included modifications to the final clarifiers to improve final clarification. The modifications have been very successful in improving this situation.

There is little flow in the tributary canal which receives the plant effluent. This condition led to the continuous deposition of the materials in the bottom of the waterway. On January 6, 1970, Dade County Pollution Control Department issued a "Notice of Violation and Order to Remove" these solid deposits. They had surveyed this canal tributary and the cross sections of the Waterway indicated a considerable deposit of these materials. In subsequent discussions of this Order it was determined that the canal deposits had existed for a long period of time.

Since this treatment facility is programmed to be retired, thus eliminating all future discharges into this Waterway, it was decided to wait until the treatment facility had been taken out of active service before removing the sludge blanket. The material removed from the canal bottom can then be processed through the plant. This procedure will also minimize the odor problems which are likely to result from disturbing the deposit. The Pollution Control Officer has subsequently required that the canal sludge is to be removed within 45 days after the deactivation of the sewage treatment plant. It is further proposed to pump the effluent after this treatment to the County Interceptor, thereby eliminating any additional effluent discharged into the tributary canal.

There is a great decrease in the observed decomposition of the sludge blanket at this time. Several good sized fish have been seen in the Waterway, which indicates a return of satisfactory oxygen levels. These observations indicate that with the improvement in plant effluent quality during the year 1970, the natural forces of the stream have resulted in a considerable recovery to desirable conditions.

SECTION 14

COMMUNITY UTILITIES FUTURE PLANS

Metropolitan Dade County is constructing a 54 inch diameter interceptor sewer. This facility will connect with the existing City of Miami interceptor system and convey the sewage to the City's treatment plant on Virginia Key. The County is planning to provide sewage transmission and treatment service to private utilities and developers with this system.

In October, 1969, Community Utilities made a proposal to Dade County as the first step in negotiating a contract with them for this service. An extended period of negotiating, proposal and counter-proposal culiminated in September, 1970, with the signing of an agreement between the County and the Company. This agreement provides that all sewage received in the Community Utilities collection system will be delivered to the County interceptor for disposal.

Upon completion of its connection, the existing sewage treatment facility operated by the Company will no longer be used for the treatment of domestic waste. In this manner, and by this system the polluting affects of sewage effluent into the Coral Gables Waterway will be reduced to zero as there will be no further discharge into these waters.

The Company will pay a connection fee of $213,500 to Dade County under the terms of the agreement. This connection fee will allow the Company to discharge at an initial rate of 3 million gallons per day. There are further provisions which permit an incremental increase to 6 million gallons per day by payment of additional connection fees in the future. It is projected that the 6 million gallons per day capacity reservation will provide for the orderly development of the Company's service area.

In addition to this connection fee, the Company will pay operating charges to Dade County covering the cost of operation of their facilities, the cost of treatment, and interest and depreciation of the project cost. It is estimated that these operating costs for the year 1972 will be approximately $260,000 for an average sewage flow of 3.5 million gallons per day.

In order to deliver sewage to the County interceptor, the Company will construct a 24 inch diameter sewage pressure main from its service area to a point of connection with the interceptor. It is estimated that this pressure main will cost $518,000.

Based on present time tables for construction, it is now estimated that this connection can be made and the system put in service on August 1, 1971.

MR. REED: Let me ask a question here.

MR. REYNOLDS: Yes, sir.

MR. REED: When this negotiation was worked out with the city of Miami to accept the effluent, had the law been passed requiring secondary treatment before disposal to an ocean outfall?

MR. REYNOLDS: I can't answer that question, Mr. Reed. I don't know.

MR. REED: I was wondering whether the city was now as committed to take it as they were prior to when they only had to have primary treatment, recognizing now that they have to have full secondary treatment of the wastes, how that would be paid back.

MR. REYNOLDS: Well, as I say, I can't answer that fully. I wouldn't want to speculate on what the city's position might be.

MR. REED: All right. Thank you.

FROM THE AUDIENCE: Would you wish a comment on this?

MR. REED: No.

MR. STEIN: We are not taking comments from the floor. We are very lenient here.

As a matter of fact, while I am talking, I wish the caucusing in the back would stop and if you wish to caucus go outside.

We will take people in order.

FROM THE AUDIENCE: I will simply be seated after I make the statement that the answer to the gentleman's question is available.

MR. REED: Fine. We will ask the question of the appropriate source.

(Mr. Reynolds continued reading as follow:)

SECTION 15

KEY BISCAYNE SERVICE AREA

The former Key Biscayne Water Company, now a part of General Waterworks-South Florida District, serves the residential and commercial area of Key Biscayne lying South of the boundary line of Crandon Park. There is a small independent water company serving a portion of this land. However, General Waterworks serves by far the majority of the developed area, including water service to the Cape Florida State Park. The real growth of the Key Biscayne area began in 1952 with the construction of a single family home development there. Since that time, there has also been an extensive development of apartments, hotels and other commercial areas.

The Company provides sewer service to 484 residential customers and 68 commercial customers on Key Biscayne.

SECTION 16

KEY BISCAYNE - SEWERAGE FACILITIES

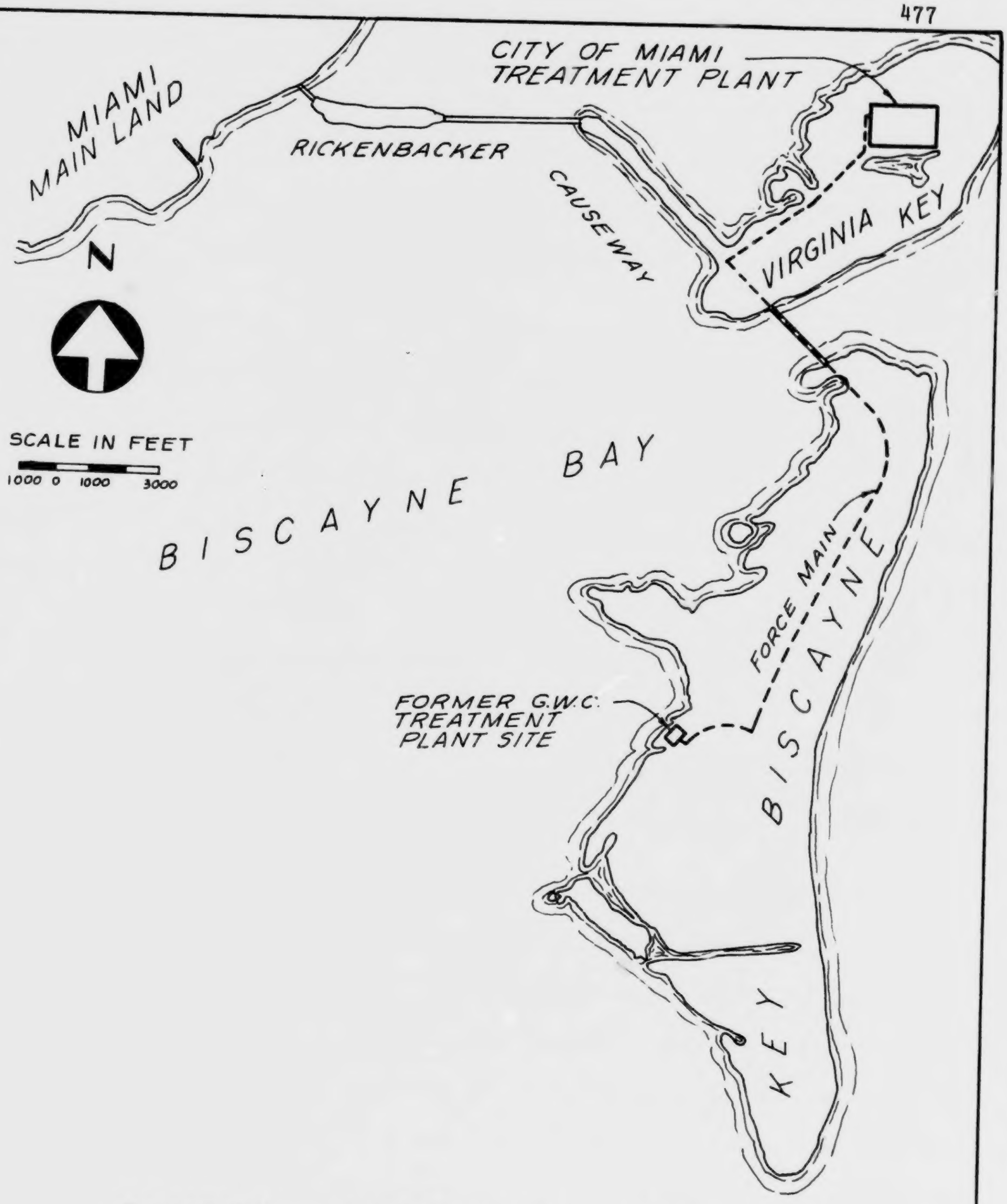
The initial housing development on Key Biscayne was served by septic tanks. The first sewage service was provided by a sewage treatment plant located as shown on the sketch on Page 16-2. The initial sewage collection system and treatment plant were built in 1954 by the land developer on Key Biscayne. The sewage treatment plant was of the trickling filter type. It was designed for an average flow of 267,000 gallons per day. The treatment facilities consisted of a primary clarifier, trickling filter, secondary clarifier, chlorination facilities, a separate covered digester and open sludge drying beds. Plants of this type normally provide a maximum of 80% B.O.D. reduction. Treated effluent from this plant was discharged directly into Biscayne Bay.

And I might note here that this facility is still shown on the inventory in the Government's report.

As the Key Biscayne area developed and projections were made for more extensive future growth, the problem of sewage treatment for disposal was studied. The effluent from the initial sewage treatment facility was discharged into shallow water in Key Biscayne Bay. **Excuse me, that should be Biscayne Bay.**

An expansion of the treatment plant indicated that considerable upgrading in treatment efficiency would be required to protect those waters. It would also be necessary to contemplate a large facility with capacity for future demands.

An alternate solution was studied and finally selected. In February, 1964, a 12" sewage force main was constructed from the main lift station to the City of Miami Treatment Plant on Virginia Key.


CITY OF MIAMI
TREATMENT PLANT
MIAMI
MAIN LAND
RICKENBACKER
CAUSEWAY
VIRGINIA KEY
N
SCALE IN FEET
1000 0 1000 3000
BISCAYNE BAY
FORCE MAIN
FORMER G.W.C.
TREATMENT
PLANT SITE
KEY BISCAYNE

GENERAL WATERWORKS CORP.
MIAMI, FLORIDA
SANITARY SEWER FACILITIES
KEY BISCAYNE SYSTEM

This is shown on the accompanying vicinity map. This force main was capable of conveying all sewage collected in the Key Biscayne area to the Miami facility for treatment. Five property owners joined with the Utility in financing this project. The project cost was $163,500.

With this pressure main in service, it was possible to retire the treatment facilities on Key Biscayne and no further plant effluent was discharged into Biscayne Bay. All sewage is now delivered to the City of Miami and the Company pays a charge for treatment by the City.

The present sewage collection and transmission systems consist of 7.7 miles of gravity sewer mains and 7.1 miles of sewage pressure mains. Sewage is delivered to the City of Miami Treatment Plant by 8 pumping stations.

This system has worked well over the years in providing sewage service to this rapidly developing area. This method of sewage disposal has entirely eliminated a source of pollution from Biscayne Bay. The abandonment and subsequent removal of the treatment facility has also enhanced the neighborhood. The treatment plant site was purchased by a builder-developer and a group of attractive apartments now stands where the treatment facility once stood.

SECTION 17

KEY BISCAYNE FUTURE PROJECTIONS

Key Biscayne continues to grow at a rapid pace. The development today is largely in the commercial type of buildings including hotels and apartments. These high population density facilities add considerable load to the sewage system. To keep current with the demands for service it will be necessary to construct a sewage repumping station along the route of the existing sewage pressure main to Virginia Key. This facility is being designed in the Company's Engineering Department at the present time and it is proposed to commence construction in January, 1971. The estimated cost of this facility is $36,800. It is also proposed to rebuild many of the existing manholes on Key Biscayne which are showing signs of severe deterioration due to the difficult ground water conditions which exist there.

General Waterworks is striving to anticipate demands in all of its service areas and keep abreast of the growth rate in these areas. These proposed activities on Key Biscayne are the further illustration of these efforts.

SECTION 18

SUMMARY AND CONCLUSIONS

General Waterworks Corporation, an investor-owned utility company, has demonstrated that private enterprise, using private financing, has the ability to effectively control pollution. This is not to say that this has all been done without problems or set-backs or that there have not been delays in development during the course of this effort. The problems to be faced in pollution abatement are substantial, and it cannot be reasonably expected that they can be solved without some set-backs, or temporary situations. If we look to the end results, in each of the three areas serviced by this Company pollution abatement is now under control and an orderly development of the service areas is possible.

From many quarters we hear private citizens, citizen groups and elected officials express their fears that nothing is being done about pollution. This simply is not the case. An examination of the records of improvements throughout the County in the last two years all point to the fact that pollution can be controlled.

The cost of this program is huge. The cost of the pollution abatement facilities, described in this statement, was $2,590,000 through August 31, 1970. An estimated $171,000 will be required to complete work in progress. The tentative construction cost for pollution control facilities in 1971 is an additional $2,190,000. These are illustrative of the large sums of money which the public demand to reduce pollution requires. In serving the public, we will attempt to meet all reasonable requirements in this area.

The economics of sewerage facilities indicate that smaller treatment facilities serving limited areas are generally less expensive to build and operate than the interceptor systems required to connect remote areas with regional facilities. Neighborhood or localized treatment facilities can only be utilized where there is a satisfactory receiving water for the effluent. The deep well disposal system described previously represents a potential major break-through in this area. The natural geologic formations represent a tremendous economic advantage to the community. By the proper use of deep well disposal great sums of money in the development of a total county-wide system can be saved. It is our recommendation that those in authority consider this method fully, and in connection with the conservation of our natural resources of fresh water, in the solution to our present day pollution abatement problems.

The proto-type deep disposal well, described in this report, was constructed entirely with private capital. The total project costs will be approximately $370,000. This expenditure was made in the belief that it will be the best possible solution to a vital community problem. After the facility is in full scale operation and an appropriate time interval is allowed for observation of the results, it is our belief that deep well injection will be more fully recognized as the effective tool it is to combat pollution and conserve water resources.

It has been our experience that the Dade County Pollution Control Department has been extremely vigorous and reasonably effective in working toward a pollution free environment. There have been periods of difficulty between our Company and that Department over the last several years. Some of these matters resulted from differences of opinion and others from inability to maintain a pace with all current developments. There have been delays in the construction of treatment facilities which occurred in the process of resolving criteria and design standards. These problems were eventually resolved and the resulting facility was often a better one because of these discussions. On balance, we believe that there has been considerable progress made in this area as a result of the efforts of this Department.

However, it would be our recommendation, and it has always been our thinking, that pollution control under a single State Department would be most beneficial to all concerned in the long run. This type of organization, properly staffed and administered, would reduce the time required for the review and approval of facilities. We believe it would result in a better coordinated and organized program at all levels. In this way, one set of standards would be more readily administered on the one hand, and more clearly understood and followed on the other. It would be our recommendation that local pollution control enforcement be accomplished under the State Department of Air and Water Pollution Control.

Finally, we would recommend that County authorities reconsider the role that private enterprise can play in providing sewer service to the community and in the control of our environment. The Master Plan should be updated. In this updating, full consideration should be given to systems which would not discharge all fresh water to the oceans. A re-evaluation of the full impact of the financial requirement of the project is also needed at an early date.

(A document entitled, "Engineering Report on Drilling and Testing of Deep Disposal Well for Peninsula Utilities Corporation, Coral Gables, Florida, by Black, Crow and Eidsness, Inc., Engineers, dated February 1970, Project No. 498-70-53, is marked Exhibit 1 and is on file at the FWQA Headquarters in Washington, D. C., with a copy on file at the FWQA Regional Office in Atlanta, Georgia.)

MR. STEIN: Thank you. Does this conclude your report?

Are there any comments or questions?

MR. REED: Mr. Stein, I am having a hard time matching this, if I am reading the proper place on the report that Dr. Fogarty gave us yesterday in which it reads Community South, of a low chlorine residue, total coliform count of 400,000 and fecal coliform count of 35,000. Is this the same plant that is described on pages 12-1 through 12-5?

MR. REYNOLDS: Yes, sir, it is. May I respond?

MR. REED: Please.

MR. REYNOLDS: Dr. Fogarty and his group were at the Community treatment plant gathering samples. One of the remarks passed by the samplers, the graduate students working with him, was that this was the best sewage treatment effluent they had seen up to that time. Now, I have no idea whether that was the first plant or the last plant they looked at, but that observation was made.

The reference to the chlorine residual that Dr. Fogarty indicated at the time he was there, the chlorine cylinder had been depleted, the operator was in the process of changing over to a new cylinder, and he was informed of this. He still persisted in taking his sample at that time.

You will note in that report that the Community North plant had a chlorine residual of 4.0 at the same hour.

MR. REED: Right.

MR. REYNOLDS: One further thing--

MR. REED: What about the overloading problem of 170 percent overloading, is that right?

MR. REYNOLDS: No, sir, it is not.

MR. REED: Would you speak to that?

MR. REYNOLDS: Yes. That was the flow meter reading at that time of their inspection, which indicated the rate of flow through the plant at that time. The average daily flow on which we base most criteria for the past three months has been 2.07 million gallons a day on a treatment facility that was designed and approved for 2.05 million gallons a day.

MR. REED: Gosh, we have gone through these averages before. Now, that one really raised my hackles, because that fish doesn't know that he is in an average condition when he gets killed.

MR. REYNOLDS: Well, Mr. Reed, recall now that a sewage treatment plant that is designed for an average of 2.07--or excuse me, 2.05 MGD also anticipates that you are going to get loads at various times during the day in excess of that. That is a 24-hour average, that is the way we rate our plants. But at the same time you can have peak rates of flow that may be double that figure.

MR. REED: Well, I think we had better start thinking about that not only in Dade County but around the State then, because I feel for that fish who got caught in the peak load.

MR. REYNOLDS: Well, the other side to that is too, sir, that the oxygen content in the receiving water is not instantaneously depleted, but it is as a result of an accumulation of flow over a period of time.

MR. REED: You think the coliform count, the reason that it is so high, is because of the changeover in your chlorine cylinder, then? That would be the reason on that?

MR. REYNOLDS: I would assume that that would be true because the residual at that time was at 0.2. In the other plant the coliform count was 0.0.

MR. REED: All right. Thank you, Mr. Stein. That answers my question.

MR. STEIN: Are there any other comments or questions? With all these difficulties, I don't know why you want to be in this business.

MR. REYNOLDS: My bosses have raised the same question from time to time.

MR. PATTON: Mr. Reynolds, I have a question for you. I notice where you talk about peninsula plant, Section 7, how you had programmed for a certain rate of growth and did not expect any great acceleration and all of a sudden somebody shoved the accelerator to the floor.

MR. REYNOLDS: Yes, sir.

MR. PATTON: Do you have any means of controlling the developer if it is another developer other than your company that is building there so that you can put the brakes on, so to speak, if they start building condominiums 20 stories high?

MR. REYNOLDS: Well, we do have, we have a--as Mr. Stein says, we have a problem in this area too, that as a public utility we are dedicated to serve our area as best we can. Mr. Stein indicated yesterday that one possible way of controlling these sorts of things would be to place a moratorium on building until the plants catch up. One thing that I failed to include in my remarks was the fact that in each of the three areas that we serve and represent we have had other bodies--State Board of Health when they were in control or through the local Dade County Pollution Control Office--we have had extensive moratoriums on building. In fact, today in the community service area the only building permits that you can obtain in this area would be for facilities that won't go on line until after we are connected to the interceptor. So that this technique has been used extensively.

MR. STEIN: I know, but--

MR. REYNOLDS: But in the case of our plant it wasn't used in time.

MR. STEIN: I recognize that, too, in your report. I think, Mr. Reynolds, you are to be commended for a very candid report. But here is the situation. And I would like to make this very, very clear. The problems that you have faced with equipment, growth and operations are not faced alone by your corporation (General Waterworks Corporation) and others indigenous to the field, but pretty generally. Time after time, we have seen equipment that has been bought and stored in good faith and nothing ever came up to expectations.

However, here is the situation that I think we have, and your report indicates this very, very clearly. With a profit-making operation such as yours--and I think you have laid this on the line as clearly as it can be laid on the line--if we are going to do that, we have to have a compatible relationship with growth in the area. In other words, you can't be expected to have a plant that has a 2 million gallon a day capacity and somehow some other authority authorizes condominiums, hotels and big subdivisions to come in. Now, as far as we are concerned, unless we can demonstrate that, the streams are not going to be clean.

This is not meant as a criticism at all, but I think what we have in this is the kind of report that somehow we fail to find gives us the relationship between the plant capacity and the condition of the canals. I think this is precisely the thing that Mr. Reed was looking at. I know the engineers and you people talk in terms of averages and plant capacity and what is going on. But if we look on the one hand and find polluted conditions in receiving waters, and on the other hand look for a causal connection and everything is running fine, where does that pollution come from? Then I think that may require a regulatory agency inquiry.

MR. REYNOLDS: Well, sir, I think you are certainly on a very valid point there. I would go to the fact that in this instance the conferees have the advantage only of a report which in itself is admittedly out of date with respect to the time and the date that is shown there. On this very point: as far as limitations on building and restrictions on connections to the companies, that a good deal of progress has been made in this area; that there is now requirement, for instance, that by the time a plant reaches 80 percent of its designed load that plans are to be submitted to the authorities for review; and that when that capacity reaches 90 percent of its design load, construction is to get under way, so that very concrete steps are being taken in this direction.

MR. STEIN: There may be concrete steps taken in that direction. I think you are talking in terms of a master plan, or I think your recounting what has happened in the past indicates that we seem to be and have always been behind in this area, not ahead.

An analysis of what you have said indicates very clearly that the system we have had in the past is just not meeting the problem because you have had to make heroic efforts to take out-of-date plants, additional impacts and loads to even remotely keep up. For example, one of your efforts is to hook into the city sewer from Key Biscayne, without any indication whether the city of Miami is providing adequate treatment of that waste load you are sending to them.

And again I think we have to look at this whole picture if we are going to get a solution. The notion of not having any pollution probably from Key Biscayne in the area around Key Biscayne may be fine, but we certainly can't accept a solution that is going to transfer that load to some other waters in the area.

MR. REYNOLDS: Our point there would be that in that case we feel it more economical in the long run and the potential for better treatment is at the city plant rather than another discharge into the bay.

MR. STEIN: We recognize that.

Let me ask you one question. Let us suppose that in the future we begin running into snags and problems such as you have indicated we have here? Suppose you have a process that you have ordered in good faith and the process doesn't work, or you build a sewer and you find that that sewer is overloaded because of building in the area over which you have no control? We have had this situation in various other cities and metropolitan areas throughout the country. Very often what we have done is ask the city authorities to put in sewers and treatment facilities which admittedly won't pay their way for many, many years, as much as 10 years, before they are up nearly to capacity, and they are just pipes lying in the ground largely unused as far as capacity is concerned--of course they are used--or plants which will not come up to capacity. And we have asked public bodies to do that. If there are these unexpected developments here, can we reasonably ask you people to do that and will you be ready?

MR. REYNOLDS: I would say yes, that the problem of cost and financing is there, whether it is a municipal system or whether it is an investor-owned system, and I know of no rate-making body or regulatory authority which would deny us the right to put such facilities in our rate base if they were required on the other hand by pollution control authority.

So that I think my response to your question is that we are definitely in a position to do that, we have the capability, and I would say that in most every case we have access more rapidly to the necessary financing than you have, for instance, with a municipality who can hang back and say, gee whiz, I have got to wait for those good old Federal funds before I can move.

MR. PATTON: That is certainly true, you can reach in if the Board of Directors has the kitty to go to.

Let me pursue this point a little bit further, Mr. Reynolds. Let's assume that your plant, just pick a number, is designed for 10 million gallons a day, you have a projected rate of growth and this developer suddenly comes up and he says, "Well, we are going to start pouring on the steam, we are going to build," and all of a sudden you can see 20 million gallons a day coming into this plant, both of them on AEF. Do you have any means of keeping him from moving that fast or are you just going to be inundated with the extra overload?

MR. REYNOLDS: No, I would say that today that we take an entirely different approach to the developer, particularly the large-scale developer as you are talking about here, and none of these projects go ahead without a very sincere conversation between a developer and a utility so that we can either tell him we can meet this schedule or we can't meet this schedule.

Now, the problem that we would get into in this area would be in the case of a situation where we might have several smaller developers that we were not aware of their progress that hit us all at one time.

MR. PATTON: What action can you take to prevent them from flooding you out, so to speak?

MR. REYNOLDS: In the case of a major developer we simply have to say we can't have these facilities on line until a certain date, you will have to revise your--

MR. PATTON: Can you keep the county or can you ask the county and secure their cooperation and see that they don't issue a building permit to that man?

MR. REYNOLDS: Well, prior to that we would take the initiative in not contracting with the developer to give him service in those cases.

MR. PATTON: In that case, then, he would not be able to get a building permit?

MR. REYNOLDS: That is right.

MR. THOMAN: Mr. Reynolds, through your report I see a tendency where General Waterworks has been connecting its sewer systems into the municipal or Dade County or city of Miami sewer system. In the future would you expect this trend to continue from your service areas?

MR. REYNOLDS: No, sir, I didn't make my point, I am sorry. If I can just back off a moment just very briefly, Key Biscayne, that is a good solid logical engineering decision, in my judgment, to take that sewage and transport it to Virginia Key for full-scale treatment.

In the case of Community Utilities, where we are tying into the county interceptor, we do not feel that this is the best overall economical solution in this instance. It came at a time when we had acquired the company; the plant was in an overloaded condition; there was a restriction on building in the area. The Board of Health and all agencies said there will be no expansion of this plant because there is going to be a county interceptor. Now, we have been waiting several years for this to come about, and I would say that also preceded knowledge and the work we have done on our prototype deep disposal well.

I think my major point is that we go back to the statements in the master plan which indicate that the sewage collection system itself is the single most expensive element in this program. Mr. Patton said that their studies showed that Dade County needed $562 million worth of collection systems as opposed to $63 million worth of treatment facilities, so that my main point is that we go back, we reevaluate the full potential and value of the more localized facilities and that we take a hard look at the boulder zone for receiving the effluent.

MR. STEIN: Do you have any more?

MR. REED: No, no more questions.

MR. STEIN: I still am bothered by the major points. Let's see, I am trying to get an answer to that.

When we deal with master plans, for example, we are dealing with very large integrated projects. I think the history has shown that where we have private utilities in the field of water and sewers they generally have been small ones. This is an historical fact. And I think listing the customs here and your elements that that is carried out farther here.

But let us suppose that we have a situation where we are developing a master plan, say, in Washington, D. C.; we are going to have a plant with a capacity of 309 million gallons a day, which probably will not be reached for 20 years; there are a little over 200 million gallons a day and they are a little overloaded there now. This will cost about upwards, at present prices, the best estimates are over $300 million.

We also have a plant on the west side of Manhattan now that is going to cost about $220 million, that is the plant and sewer.

In Cleveland there is a plant which is going to cost well in excess of $100 million, which will be the city's share and the Federal share will probably match that to bring it up to $200 million.

Now, with that kind of problem--and let's take Washington because that is the one that we did most recently and it is closest in my mind, but the same situation pertains to all. We would not expect the people to make this kind of investment, to put the burden on them. No one expects them to do that. The thought was that the Federal Government would put up a considerable amount of the funds--perhaps up to 55 percent. In New York City, New York State came forward with approximately 60 percent of the funds. Ohio, in Cleveland the State came forward and the Federal Government came forward with a considerable portion of the funds to finance this master plan to put it into effect.

The question that I ask you in this sense is: Recognizing the system that you have, how do you propose we are going to be able to do this kind of financing of the master plan at this time when the obligation is to place that cost upon the consumer immediately if you don't do it? I am not pushing this. I would like to have an answer because I do think that your record of getting at problems certainly shows as much imagination substantively as any we have had in the field. But I want to know: How are we going to get over this kind of hurdle in dealing with these real expensive master plans for a metropolitan area, where the key to this may be the putting in of hundreds of millions of dollars of public funds for which we can't expect a return for many, many years?

MR. REYNOLDS: I think we are in the area of private versus public, certainly.

I think my whole point there, Mr. Stein, is simply this, that the magnitude of this problem, just as you have outlined by those numbers and by Mr. Patton's numbers with respect to our local Dade County problem, my basic point there is that in considering how we are going to tackle this job and get the job done that it is not either/or; it has got to be a cooperative thing. I am merely saying that private enterprise is standing in the wings and willing to accept a share of that burden.

MR. STEIN: I suggest, sir, that on this the key here is to work this out with your locality. Now, again let me give you another example.

In Omaha there was a private corporation that was set up to handle the wastes from the packinghouse district and pretreat it before it went into the main plant. We had no objection to this. However, that was a long time coming. Arrangements had to be made between the people who set up this corporation in the packinghouse industry and the city. The public officials were asked over and over again to take a position on this. Our position has been steadfastly this: Our job was the protection of the Missouri River near Omaha, and however this was done or financed internally was a matter of the city, the industries and any corporation or utility district in there; this was not our concern.

However, I think what we are going to be faced with is an obligation on the part of the regulatory officials here to be sure that discharges, wherever they come from in the Dade County area, are not degrading water quality and are not in contradiction of water quality standards. I hate to say what our checkpoint is. Our checkpoint is the peaks and the extremes that you push the streams to, and we are going to examine those peaks and examine the discharges and the effect on the streams at those peaks. While we are going to be very sympathetic and interested in averages, it is not going to be the fundamental issue when we make a decision of whether we have to clamp down on a particular point or not.

Are there any other questions or comments?

Thank you very much.

MR. REYNOLDS: Thank you.

MR. STEIN: By the way, again I want to congratulate you on this statement. I think this is one of the most candid statements--I am not going to pick on some points that I might--but it is one of the most candid statements on life in the waste treatment business and the difficulties of treating it. You are to be commended for bringing this forward.

Thank you very much, sir.

MR. REYNOLDS: Thank you.

MR. REED: Let me ask Dr. Garcia-Bengochea, how long are you going to require? Are we going to get a summary from you and some slides, is that what we are going to get?

DR. GARCIA-BENGOCHEA: No, Mr. Reed, I was planning to follow the whole text and it will take about 45 minutes.

MR. REED: Well, I promised, Mr. Stein, to get Mr. Redford on this morning and I want to live with my promise on that. I don't think it will interfere with the presentation to put him in. He needs 30 minutes.

And I think possibly what we are going to do, I don't think it will break the continuity of the presentation, is take you directly following luncheon.

MR. STEIN: Is that agreeable?

DR. GARCIA-BENGOCHEA: Yes.

MR. REED: Thank you.

MR. STEIN: By the way, I really do think this is a clear breaking point.

MR. REED: Yes.

MR. STEIN: Because I think we have had a very good discussion on Mr. Reynolds' paper. I looked at some of the material that you are presenting. I think that is very vital, too, but I think they can be handled separately and not necessarily intermeshed.

MR. REED: May I suggest that we take a 10-minute break and come back in and hear Mr. Redford's presentation?

MR. STEIN: We will recess for 10 minutes.

(RECESS)

MR. STEIN: Let's get started. Mr. Reed.

MR. REED: Mr. Stein, I will call on Mr. James Redford.

Mr. Redford.

JAMES F. REDFORD, JR.
MANGROVE CHAPTER, IZAAK WALTON LEAGUE OF AMERICA
MIAMI, FLORIDA

MR. REDFORD: Good morning.

My name is James F. Redford, Jr. I speak for the Mangrove Chapter, Izaak Walton League of America, as Vice Chairman of the Hoover Environmental Legal Defense Fund; and for 30 other citizens' groups who requested Governor Kirk to call this water conference. We asked him to call this conference because, frankly, we were scared. Our beaches, creeks, canals, rivers, lakes and a good deal of the earth itself were and are dangerously polluted by human wastes. The situation worsens each year, and in 12 years the county has done little or nothing. No serious remedial action has been taken, and little of serious import is planned.

This, then, is a cry for help.

J. F. Redford, Jr.

What has produced this crisis?

1 is our old friend rapid population growth. As you know, from 1960 to 1970 our population has increased somewhere in the vicinity of 300,000 people.

2, inadequate population control laws and enforcement.

3, commitment to the small, inefficient, poorly-run sewage treatment plant.

4, lack of planning and technical knowhow.

Let's discuss these points in some detail.

Population is exploding everywhere, but nowhere worse than in the Dade-Broward area. If you equate people with dirty water, then in 10 years our sewage flow, and I am talking about Dade only, has increased by 30 million gallons. Most of this is untreated.

2. Dade County's first water pollution control laws were passed in 1961 to enable an oil refinery to locate on Biscayne Bay and the assistance, I may say, of the oil refinery was asked in drawing these. From 1961 to 1967 the laws were virtually unenforced. In 1967 the county set up a new Water Pollution Control Department. The director of that department served from its inception until last week. It's difficult to find a verb which describes his tenure. Perhaps we can say, like the latter day English monarchs, he reigned but did not

rule--but noisily nevertheless. In the two years he served, some 60 pollution charges were filed. This number is disputed. It changes from time to time. A goodly number were tossed out of court for such understandable confusions as an inspector charging an excessively dirty outfall when, actually, it was the inflow he had sampled. May I also point out that the county pollution control laws have twice been submitted to the State for approval and twice turned down as substandard. I may add on to that, they are still, at least technically, unapproved.

The situation in Dade County is this: 50 percent of the town is on septic tanks, 35 percent on ocean outfall and 15 percent on sewage plants. These are approximations. Most of the ocean outfall is completely untreated. The balance receives about 75 percent treatment. I might revise that. There is one outfall where it doesn't get any treatment, it does get ground. That is grinding this way (indicating).

The sewage plants dump into canals and rivers, many of which have no flow for a good many months of the year. Thus, sludge banks infect most of our waterways. Most plants are overloaded. Thus, most of our waterways are showing high contamination counts.

Before leaving this point, another word must be said about enforcement. A few months ago the Izaak Walton League was informed of flagrant industrial pollution by Velda Farms Dairy in North Dade. We checked and called in the press. We always called the press instead of the pollution control officer. It was that kind of a department.

The dairy was dumping approximately 100,000 gallons of industrial wastewater on the ground in back of the plant. What they had was a little concrete sump and a Sears and Roebuck pressure pump and this would sort of blow it out. It was the strangest biota that you could imagine in the backyard. It ran into a drainage ditch alongside a railroad track, thence into Snake Creek and thence into "Beautiful Sky Lake."

It turned out that the county was allowing the dairy to do this as long as they paid $800 a month to the county. The money was to be paid until the sum reached $100,000. The money was to be used to help defray costs of a sewage transmission line to be built by the county in some uncertain future. A nearby dairy was also permitted the same for slightly more money. Bigger dairy. The pollution control officer denied being in on the deal. The assistant county manager insisted that he had been. Later the pollution control officer said it was an "oversight." Still later, he said it was a "value judgment."

But there have been questions of the pollution control officer's veracity before and we are not here to beat what you might call a dead horse.

So both dairies were allowed to hook up to Myrtle Grove plant, which is vastly overloaded. Incidentally, it has been found that some factory, and I don't know which one, is dumping cyanides into the Myrtle Grove collection system.

As a concession to overloaded Myrtle Grove, one of the dairies is now dumping all its cottage cheese whey into the North Miami ocean outfall. They were dumping landward of the outfall pumping station until the pumpers complained. Now they dump seaward of the pump. There is no treatment on this line except grinding.

We now have a new county manager and pollution control officer. Now plants are checked on weekends and at nights. May I say there has been considerable improvement since the announcement of this conference and in the wake of the recent Grand Jury report.

But even if the new man does all that can be done, things will be cleaner but not clean enough.

For one thing, our laws make it difficult to punish or even correct a polluter. First, he must be warned. If he hasn't corrected this in 10 days, he can be charged, but in the interim he can apply for a variance which, if granted, negates the warning. Our laws also make a very strong point that if a violation is found, prosecution is discretionary with the pollution control officer. Therefore, pollution is neither felony nor misdemeanor--just a "no-no."

Then there are our courts. Our county attorney has ruled that all pollution cases must be tried in Metro courts, despite the fact that the pollution control officer was a deputy of the Florida Air & Water Pollution Control Department. In Metro court, the maximum civil penalty is $500 a day. In the State, it's $5,000 a day.

Further, our courts generally have felt that if a man is not in violation the day he appears in court, he should be forgiven for the day he was in violation. By the use of our inadequate laws, polluters have staved off penalties for years while remaining in constant violation.

Point 3. The villain of most of our waterways is the small sewage plant, 80 percent of which are privately owned. We had 100 such plants a year ago. They have increased somewhat since then. A year ago the pollution control officer said in the press that only 2 of the 100 were producing satisfactory effluent. It's interesting to note that the longest customer moratorium on any of these plants, including the very few charged with violations, was 30 days. There was much advertisement of the fact that a moratorium had been put on new hookups, but nothing was said when it was removed. The worst in the county, Myrtle Grove, was, until last week in any case, still allowed new hookups, while the kids at recess from the school next door chase bubbles blown over from the plant. They are still authorizing these small plants in Dade County and did virtually authorize one just a few weeks back.

Presently, approximately 75 percent of such plants are overloaded. The Izaak Walton League and the Hoover Environmental Legal Defense Fund have found most of our waterways polluted above safe levels for contact. Also, some sections of the ocean and bay.

But the king-size villains are the ocean outfalls. Each year the flow from North Miami and Miami Beach outfalls increases mightily. Now the county gets in the act by wanting to build a North Miami Beach outfall, and they complain, also mightily, because the effluent must be treated beyond primary. Miami Beach, with no treatment and a short outfall--I must correct that, it has now been lengthened--known affectionately to grouper fishermen as the Rose Bowl, says it's going to cost too much money to condemn land for a treatment plant. They want to hook up to the city of Miami's Virginia Key plant.

And what about this plant? Well, it has a capacity of from 45 to 50 million gallons a day. It often treats at peak loads as much as 60. I understand from Dr. Fogarty's figures it is around 102 percent of capacity. But it is scheduled to receive the effluents from three major sewer projects in the southern part of the county, one in Coconut Grove, one in Coral Gables, and one in South Miami.

Treatment at the Virginia Key Plant is high-rate primary or about 75 percent, but it discharges in only about 18 feet of water. The Izaak Walton League has found recently that the plant also discharges in even shallower water, i.e., Biscayne Bay, and raw at that. Storm sewers also feed Virginia Key. All sewage, storm and sanitary, runs through a chamber to screen out the grit found in stormwaters. Every so often the chamber is emptied and a load of cigarette filters, black water, watermelon seeds, grit and chewing gum is blown into a tidal creek which empties into Biscayne Bay. I have never seen so much chewing gum in my life. It just stands in a big blanket over an area probably about a half or a quarter of an acre large. Halfway down the creek, we've gotten total coliform counts of 8,400, fecal counts up to 1,040. And I understand the head of that plant thinks that was a passing bird when we took the sample. (Laughter.) At least it wasn't the fish. I will leave Mrs.Wainwright to exonerate the birds.

There are plans to expand Virginia Key Plant. They are in the "talking stage." But new collector pipes are a reality, and the question is whether Miami will be able to resist the blandishments of Miami Beach to hook up before expansion of the plant is a reality.

Point 4. By now you can see what our problem is. The solution is obvious though expensive. We need a county-wide, interlocking system of large, modern, efficient tertiary sewage treatment plants capable of nitrogen and phosphate removal. So far, no agency of government has shown itself able to design or build such a system. I must correct that, it is our particular agency. As they say, it's "in the talking stage."

On the contrary, Metro has committed itself to perpetuating the private plant, small, inefficient, uneconomical, poorly run, and I might add also probably not paying unless it is attached to a development. Further, no attention has been paid to where or what quality of effluent will be dumped. For an example, within the last month the package plant was approved to dump into a canal which sometimes flows into Everglades National Park.

Metro has no updated master plan, although there is one, again, in the "talking stage."

Stepping aside from my presentation for a moment, I might point out in checking just last week I found that the Metro Water and Sewer Authority has set up--it began the first stages of a private plan and they did this by referring it to a planning department, planning and zoning department of the county. It is now still, you might say, in the talking stage over there.

There has been no land set aside for county plants. Only a third the necessary planning monies have been appropriated. A revenue bond issue has been proposed, backed by cigarette tax funds, to purchase certain private treatment plants. Maximum bond interest by law is 7-1/2 percent. This presents two possibilities--1, maybe the bonds won't sell. 2, if Metro acquires the plants indicated, they will be in the pollution business, since some of these plants are chronically overloaded. The question is when they will be cop and when robber.

In the meantime, we missed Federal matching funds for fiscal 1971 and are almost certain to lose out for 1972. Palm Beach County may get as much as $11 million for fiscal year 1971. Estimates are we will have lost something in the vicinity of $25 million in grants by our procrastination.

But growth goes on. A developer wanted to build a new town for 175,000 people. Everything was planned except the sewers. The county staff came up with a gimmick. They had authority to build a two million gallon a day plant for a black neighborhood in South Dade. They got Federal funds by putting the collector pipes in first, then threatening the Federal Government with dumping raw into Black Creek.

Saga, the development company, was promised the county would then double this interim plant if Saga would redouble it, bringing the capacity to about 9 million gallons daily. But Saga needed twice that when fully developed. No comment by the county staff. Fortunately, it was turned down by the Commission. But a week from now they are up again, this time for 65,000 people. Now they say they will build whatever the county asks. But they will dump into Black Creek, which will receive effluents from four plants, Saga will be five, and all of which eventually will go into Biscayne Bay across from the monument.

Last December we got a 1,300 fecal coliform count at the mouth of the creek. Federal funds have been received for a park and wading beach at this location.

Seaports are being pushed. There is no building moratorium on any overloaded plant or untreated outfall. More new towns are planned opposite Biscayne Monument and all is still in the talking stage while we drown in our own wastes.

J. F. Redford, Jr.

This conference has been called politically inspired. It is getting the Governor votes, it is said. Well, I am sure he won't throw out any votes this conference may produce, but I will tell you now, he would have lost votes if he hadn't called it.

Just to name a few of the petitioners: the Roman Catholic Archdiocese of South Florida, the Greater Miami Jewish Federation, the Audubon Society, the Izaak Walton League, the Dade League of Women Voters, the Federation of Women's Clubs, the American Association of University Women, the Junior League, the Miami Rod & Reel Club, the Tropical Anglers' Club, the Inter-Professional Council representing CPA's, CLU's, doctors, lawyers, dentists, engineers, veterinarians and others, the American Institute of Architects, and many other organizations.

As in all his conservation efforts, Governor Kirk has been nonpartisan and the conference was called because we needed help and asked for it.

We understand this conference has the power to initiate action, some immediate, some after a specified waiting period. We therefore request as follows:

1. Immediate enforcement of State pollution laws in Dade County. We ask that the new county pollution control

officer be deputized by the State and instructed to try all cases in State courts.

Now, I want to emphasize this. This is just the State laws, as you conferees know. As for the other people, I might point out that we are supposed to have the State laws as a minimum standard and our laws at this point are not accepted by the State as meeting the minimum standards.

2. We ask that Dade be compelled to update their master sewerage plan. But money is needed. I might say as an aside here, I understand that only $66,000 has been appointed for a sewer plan here in Dade County, another $66,000 is planned as services from the county planning department, and the balance was supposed to come from the Federal Government. And we understand that there is a little doubt about that. And we ask assistance of the State and Federal Governments to fund at least a portion of it. We need it. They haven't funded it, I know, but we still need it.

We also ask the loan of such expertise as is necessary. Some day soon waters must be recycled. According to the U. S. Corps of Engineers, we face water shortages in 5 years. This fear must be incorporated into the planning.

3. The county must be instructed not to permit discharge of sewage effluent into canals which for any portion of

the year flow or overflow into Everglades National Park. A moratorium must be declared on any new hookups to overloaded or undertreated or consistently mismanaged private or public plants emptying directly or indirectly into or into the vicinity of the Biscayne National Monument.

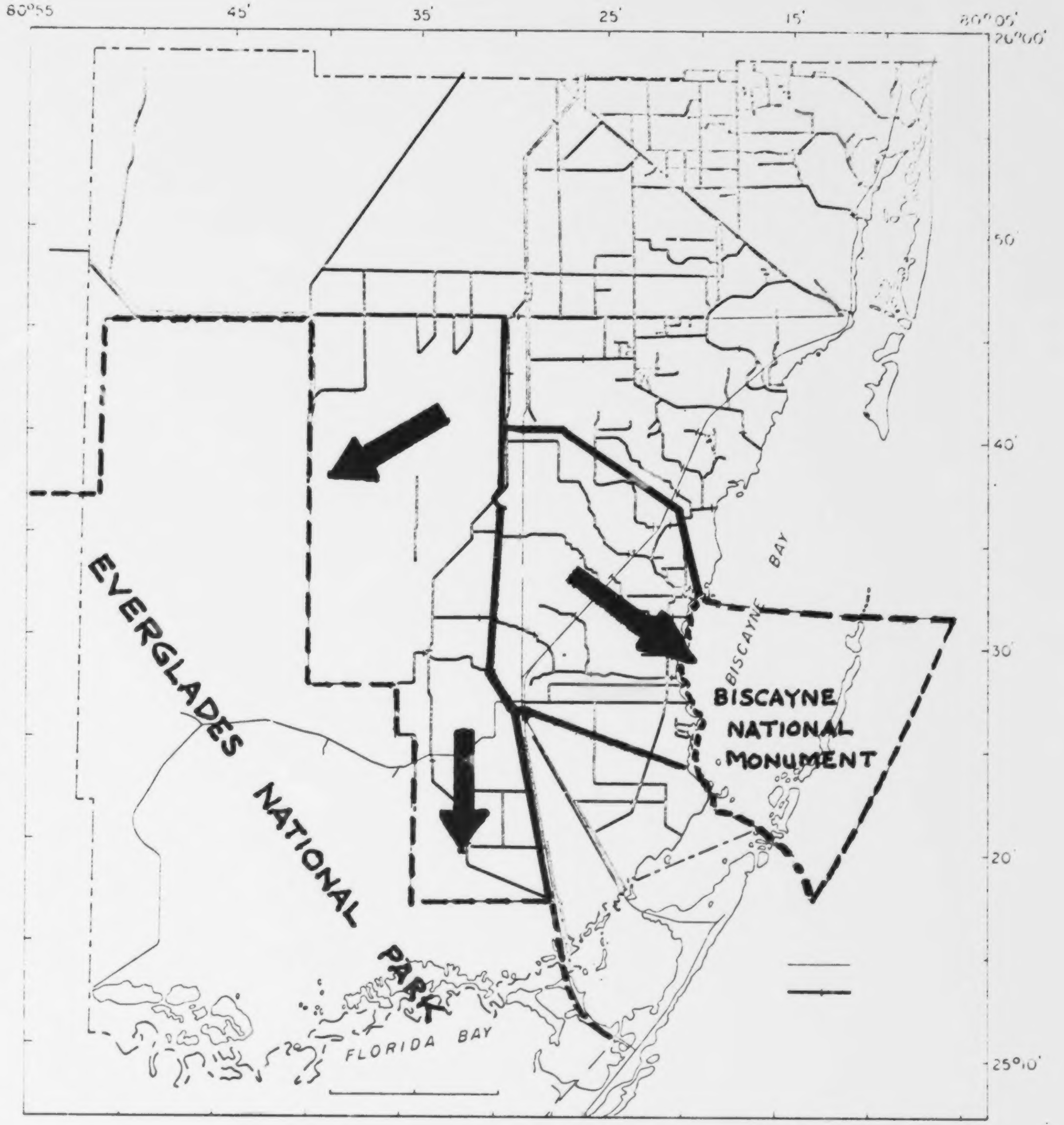
I would like to just show you these figures and enter one small map into evidence if I may.

This is a map that was set up for me by friends, and I may explain to you, this is South Dade and that area where you see the blue arrows is the entire area. That entire area essentially drains into Everglades Park for at least a portion of the year. Now, the figures there are--

MR. THOMAN: Jim, just a minute. For the record the blue won't show. These are the arrows that indicate flow to the south and into the southwest?

MR. REDFORD: Right. Now, these canals for a good deal of the year don't flow at all, but when they do flow, particularly in the rainy season when the structures are open, they will flow either into canals that empty intc the park or directly in.

This area marked with the blue arrows is approximately 330 square miles or 211,000 acres. Now, it is in this area where in the past months a small plant on State Road 27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EVERGLADES NATIONAL PARK
BISCAYNE BAY
BISCAYNE NATIONAL MONUMENT
FLORIDA BAY

for a 167-acre development is being allowed to dump into a canal there. We defeated one that was going to dump into a canal west of Homestead and we have yet a third one coming up.

We feel in your reports that you have made some similar provisions for the Biscayne Monument and this must also be done for the Everglades National Park, particularly since Interior and other agencies have such a stake on the north border for the jetport question. We feel on this border it is just as necessary, and perhaps even more so, because it is closer to some of the more visual areas of the park.

My fourth recommendation is ocean outfalls which are undertreated or untreated or are discharging too close to shore should have a moratorium declared on all new hookups.

5. All sewage control plants which are overloaded or undertreated must also be covered by the moratorium.

6. A firm standard for septic tanks as to density per acre must be ordered. And I think in addition, special consideration must be given to those or against those, whatever you like to say, abutting waterways, particularly in the Snapper Creek area. I understand that there is a very serious threat to groundwater in that area.

And finally, gentlemen, let me emphasize that as drastic as such moratoriums may seem, there is a recognition that little will be done in Dade County without them. This is the opinion of both our major newspapers and most of our enlightened citizens who live here all the time.

Let me rephrase. A county that has done as little in 12 years towards cleaning up as Dade has cannot be brought to life by gentle taps. The threat of no Federal funds is insufficient, as shown by the slowness and the lack of concern in this monstrous problem. Without the moratorium there will be little incentive and an even greater proliferation of small, inefficient, uneconomic, poorly-operated private plants.

Please accept this bit of local lore as valid. I think you will find it so in the future.

Thank you.

MR. STEIN: Thank you, Mr. Redford.

Any comments or questions?

Mr. Redford, I would like to ask you a few.

You are saying ocean outfalls which are undertreated or untreated or are discharging too close to shore should have a moratorium declared on all new hookups. Do you know any ocean outfalls in this area which don't fit that category?

MR. REDFORD: No, I don't.

MR. STEIN: You say that all sewage plants which are overloaded or undertreated must also be covered by the moratorium. Do you know of any sewage plants that fully treat their wastes to meet water quality standards in this area?

MR. REDFORD: There are a few now, I know, that are not hydrologically overloaded. I don't know about the treatment. I understand that just statistically about 75 percent of them are inadequate.

MR. STEIN: Are hydrologically overloaded, but do you know if any of them put out an effluent which meets water quality standards in the receiving water?

MR. REDFORD: No, I don't know of any. There may be.

MR. STEIN: Well, if there were any, I haven't heard about it in the conference.

You also in your map indicate about flows to the Everglades of Biscayne National Monument, and as far as I take it, given the state of affairs in your recommendation, you are proposing a real wide moratorium on new hookups?

MR. REDFORD: Well, certainly until they can set up proper treatment for the Miami Beach and off-Miami outfalls and the--

MR. STEIN: I am just following the facts--

MR. REDFORD: Yes.

MR. STEIN: --where you lead them. I haven't heard any contrary evidence substantially to what you have had in your paper.

MR. REDFORD: Right. We would be against particularly hotels, since they produce so much more effluent than the average.

MR. STEIN: Let me go over your recommendation again.

If the position of you and your group is to recommend a moratorium and we have to look hard to find a sewage treatment plant that is satisfactory to hook onto--if there is one I would like to know which one it is--if the ocean outfalls are unsatisfactory; if we have drainage into Biscayne National Monument and the Everglades and we put this program into effect--then what we are being asked to do, if we have to get action here, is to have a pretty generalized moratorium in the area until treatment facilities are put in? Is this correct.

MR. REDFORD: I would imagine it would be pretty general.

MR. STEIN: Thank you.

MR. THOMAN: Mr. Redofrd.

MR. REDFORD: Yes, sir.

MR. THOMAN: You indicate here--and I would like to know the basis of your recommendation or your feeling on this--you are indicating that by denying Federal funds for construction of sewers, and so forth, that this wouldn't stimulate the local governing bodies to act?

MR. REDFORD: Mr. Thoman, I don't think so, if you can examine some of the local known facts here in the county. For an example, I mentioned Saga development, which would be some 2,800 acres. They have agreed with the county to build the entire sewerage plant out of their own funds and turn it over to the county, so here is a town of we will say sixty to seventy-five thousand who will not meet Federal funds, apparently.

Another area that is proposed is some land further south, around 13,000 acres, I think it belongs to Connecticut Mutual and U. S. Steel, who have been flirting around with an idea of putting in a development--and I assume that they will probably do much the same thing--a development of this size. And if you will tolerate this, as the county does, the small private plant, and you have enough attendant development to go along with it, it pays you to put in your own plant if it will be tolerated by the county.

In addition to that, I will just reiterate, they have gone in and approved $25 million in a revenue bond issue to acquire a number of existing plants. Now, these plants, as you know, will probably receive no Federal matching funds whatsoever. There is nothing planned for any funds for Federal grant in aids within the next year that we know of.

MR. THOMAN: This is interesting, Mr. Redford, and if you are correct it would indicate that the local governing body is apparently quite wealthy and that the local people are not interested in Federal aid to assist them.

MR. REDFORD: Well,I think it is all--I think we would have to seek another sin there.

MR. STEIN: Let me pursue that just one moment a little further, because I think the implication that Mr. Thoman brings up is very interesting indeed.

There has been considerable controversy in the Congress about Federal funds. The Congress has appropriated a billion dollars for grant funds because of the tremendous clamor in the country, as I understand it, for this--much above what was asked for even in the budget. Even with the billions, as I understand it, we don't have nearly enough funds to go around to meet the demand for these monies.

But I understand that none of this money is being asked for in Dade County?

MR. REDFORD: As a matter of fact, some of it was--

MR. STEIN: Now, how do we fit this together?

MR. REDFORD: Well, sir, I think as we get into the fact that we are having a great deal of difficulty with our Metro charter, there is a great move on for reforming the Metro charter and changing virtually the entire government system here in Dade County. I think that move is very strong, and I think that probably the government has been unable to deal with it, certainly they haven't.

One other occasion, recently the town of North Miami Beach, who is the owner of Myrtle Grove, the worst plant we have, had a bond issue up to build an outfall, an additional outfall with a treatment plant on it. Granted, they have turned this down about once or twice before on a bond issue. But right in the middle of this, the new Water and Sewer Authority of Metro got into kind of a hassle with these people and refused to allow them to have the franchise, you might say, for this area. So naturally,the bond issue was turned down,and that one item which would have amounted to anything in Dade County was now knocked out--I think it was something like $2.5 million for that year.

I think it is probably all of our faults, the citizens and our politicians and the whole works. It is sort of a mass specklessness here in this town and we can't seem to do anything.

MR. STEIN: I think just those hard facts--and I think this is a commercial country and a money country, we understand these hard facts--speak for themselves. I think we have this tremendous appropriation made by the Congress; I think we have large city areas in the country asking for more money than we have; and then we find one place in a major area that isn't asking for a dime, and I don't know that we have to go much farther than that.

MR. REED: Mr. Stein, since I have been charged with the 660 program with Mr. Patton, I have faced on a weekly average a clamor from city after city that wants part of the action, have their plans ready. I think we could approve this year if we had the money probably $60 or $70 million worth of 660 funds in Florida. That is how many communities are ready to go. Palm Beach County could probably be qualified, besides the ten or eleven or twelve this year, they are ready to go with ten more million. Other communities are standing in line wanting to get a higher priority.

I would like to add one other thing. On the much maligned ocean outfalls, the requirement under the law is, it couldn't be clearer under Chapter 28-5, where less than secondary treatment is proposed, ocean outfalls with diffusion devices shall be installed to terminate at the Gulf Stream. We know of one, certainly, that doesn't make the Gulf Stream in 18 feet of water. (Laughter.)

I am afraid that, you know, the conclusions are obvious that the State has got to--the primary responsibility here apparently is in a vacuum and has got to come into Dade County in a big way.

MR. STEIN: Anything else, Mr. Redford?

Thank you very much for your statement, sir.

MR. REDFORD: Thank you.

MR. REED: Mr. Stein, I have another list here. Dr. Garcia-Bengochea has asked for the first hour following luncheon. If I could just ask in the room for a show of hands.

Is Mrs. Evoy here from Tropical Audubon?

MRS. WAINWRIGHT: No, Mr. Reed. We certainly want to abide by your wishes. I am Alice Wainwright, President. We asked Mrs. Evoy to make this presentation, but we want to comply with your time schedule.

MR. REED: May I suggest, then, that I give you the time slot of 2:30.

MRS. WAINWRIGHT: 2:30, fine.

MR. REED: Following Dr. Garcia-Bengochea.

MRS. WAINWRIGHT: Thank you.

MR. REED: Is Dr. Grune present?

Is Mrs. Perry present? Mrs. Perry, I will give you just following Tropical Audubon, which will be somewhere, presumably, around 10 minutes of 3 or in that neighborhood.

And Mr. Walter Wyatt? Mr. Wyatt, how about shortly following Tropical Audubon, which will be somewhere--excuse me, Mrs. Perry--you will be following Mrs. Perry sometime right around the 3 o'clock hour.

Mrs. Joyce Tarnow. Mrs. Tarnow,zero pop?

John Corris? John Corris from Coral Bay Property Association? All right.

Well, anyway, Mr. Stein, I have my schedule set to shortly after 3 o'clock and we have the other listed. If Mr. Leach comes in I would give him priority over anybody else, for the record. (Laughter.) And Mr. Carter will speak for the county in the late afternoon.

So I would suggest we break, sir. It is 5 minutes to 12 and we can't get anybody else in.

MR. STEIN: All right.

Again let me--

MR. REED: Ladies and gentlemen, please.

MR. STEIN: May I have your attention.

I assume Mr. Leach may be that mysterious one who has been referred to by illusion here very many times, and I hate to have the conferences and hearings without someone getting up and defending himself. I want to assure you that I would like to make an effort to get word that the conference is open and the record is open for his presentation, but we can't stay here forever.

MR. REED: I will assign that responsibility to someone, yes, sir.

MR. STEIN: Right.

We will stand recessed until 1:30.

(NOON RECESS)

AFTERNOON SESSION

WEDNESDAY, OCTOBER 21, 1970

(1:30 o'clock)

MR. STEIN: Let's reconvene.

Mr. Reed.

MR. REED: Dr. Garcia-Bengochea, the floor is yours, sir.

DR. J. I. GARCIA-BENGOCHEA, Ph.D.
BLACK, CROW AND EIDSNESS, INC.
CONSULTING ENGINEERS
GAINESVILLE, FLORIDA

DR. GARCIA-BENGOCHEA: Thank you very much, Mr. Chairman.

I have to apologize for two things. Number one, for having those figures in color. We will try to see if we can remedy that. Number two is for my deep Southern accent (laughter) and there is very little I can do about that. I was born and raised 90 miles south of Key West, and I am stuck with that.

My name is Jose Ignacio Garcia-Bengochea. I am representing the consulting engineers firm of Black, Crow and Eidsness, on behalf of our client, General Waterworks Corporation. One of the main fields of activity of our firm is water supply and waste disposal.

Before we enter into technical aspects, I would like to present to this audience a question which, in my opinion, is of paramount importance: What is the engineer's responsibility to its client or employer, be it a private or a public concern?

An answer to that question some 20 years ago was, "To render him the most economical solution for the problem under consideration." Today that answer not only sounds obsolete, but is regarded by many as highly offense to our modern society. We hear more and more every day that economics is not the decisive factor for our socio-political questions.

Change seems to be the word of the times--change of the standards, change of principles, change everything. Change is the essential ingredient of progress, but excessive and uncontrolled change in a society can be as disastrous as excessive and uncontrolled acceleration in a vehicle.

Ethical and philosophical principles very seldom, if ever, change. Man attempts to change the meaning of the words in those principles when not convenient or in agreement with his weaknesses, selfish, or complacent behavior.

Has our ethical principle, "To render him, our client, the most economical solution," changed? Is it really obsolete? Is it actually offensive to society? I do not think so. I think that as mentioned before, some men have just tried to change the meaning of the words. They have interpreted most economical as the cheapest, which is very seldom economical at all. They have equated solving a problem to passing it to someone else, be it another person or, in our field, another stream, lake, sea, or aquifer. And they do this regardless of the consequences or the capabilities of this "someone else" to cope with such a problem.

Solving a problem is, for a responsible engineer, the achievement of his client's or employer's goal, without hurting his client, his neighbor, or society. And the term "most economical" must be understood as the achievement of the required goal with the least amount of investment, initial and future, either work or money, client's or others, consistent with a true solution as described above.

Once we have clarified the proper meaning of our words, we may say very proudly--now, or at any time--that it is the engineer's responsibility to render to his client or employer the most economical solution for the problem under consideration.

Two more philosophical thoughts before entering into the main topic. We have said that change is the essential ingredient of progress, and progress may change into uneconomical a solution that was economical only a few years ago. Or, it may turn into economical one that just yesterday seemed like an illusion.

And the next thought: Please let us use reason and not emotion. Most controversial subjects can be solved and put to beneficial use by reason. They can be worsened and made catastrophic by emotion. I sometimes wonder how authentic and sincere are the feelings of those who picket and march in the fight against pollution--when they themselves do not seem to practice the most elementary principles of personal hygiene. How can a person preach and fight for a clean environment when his own microenvironment--body and soul--is unclean? Isn't this a clear sign of emotion?

Going back to our main subject, let me express that our firm is not an advocate of waste disposal wells. In one particular instance we strongly recommended to one of our clients the abandonment and plugging of an existing disposal well in a completely different part of Florida. Hydrogeological considerations indicated that such well was the cause of a pollution problem. Action by the client showed the soundness of our recommendation.

We believe, however, that hydrogeological conditions of an area can make such type of disposal, after proper treatment, the best solution for a particular area and user. This is the case of the Sunset Park Wastewater Treatment Plant at Snapper Creek Canal in Dade County, Florida.

An explanation of the fundamentals of well disposal will help our statement.

Underground wastewater disposal by wells can be achieved successfully if five general requirements are fulfilled. These are:

1. There is a stratum or strata which can accept the waste.

2. The hydraulic and structural characteristics of the aquifer will not be changed significantly by the disposal of the waste.

3. The disposal of such waste will not impair the present or future use of the water in such stratum or strata.

4. The disposal of such waste will not impair the present or future use of the water in adjoining water-bearing strata (aquifers) or surface-water supplies.

5. The installation is designed properly, with consideration of the physical, chemical, and biological characteristics of the waste and the hydrogeological characteristics of the receiving aquifer and confining strata.

Failure to meet some of the above requirements has resulted in water pollution, deficiencies, and accidents which have given disposal wells bad publicity and the controversial nature which the subject now has.

Compliance with the above requirements was the key to the successful completion and testing of the disposal well described herein.

Now, in order to avoid a little bit my Spanish accent, I am going to try to show some of the slides to you.

MR. PATTON: Are these in Spanish? (Laughter.)

DR. GARCIA-BENGOCHEA: Some of them might be.

General Waterworks Corporation owns and operates the Sunset Park Wastewater Treatment Plant located at S.W. 83rd Street between 97th and 98th Avenues in Dade County, Florida. This is Snapper Creek Canal (indicating), Biscayne Bay (indicating). You cannot see it here, but this (indicating) is the International Airport. The plant,presently being expanded to a nominal design capacity of 3 MGD, will produce an effluent with 90 percent organic load reduction.

The effluent from the waste treatment plant is discharged into Snapper Creek Canal, which flows downstream through residential areas of South Miami and Coral Gables and finally discharges into Biscayne Bay. Regulatory agencies demanded further organic load reduction and nutrient removal or the selection of a different place of disposal.

Location of the plant and knowledge of the favorable hydrogeological conditions underlying the area pointed to deep-well disposal as the optimum solution to the problem over other methods of disposal or further treatment. The selected method would also have the additional advantage of water conservation, to be discussed later, but would require the construction and testing of a well to prove the theory. The owners agreed to sponsor the enterprise.

Preliminary conferences with the regulatory agencies indicated approval of a deep-well disposal system as proposed, provided the effluent met the requirements adopted in the State's water quality standards (90 percent removal BOD), and conditioned to satisfactory testing of the well prior to any wastewater disposal and to special monitoring and operational requirements during normal wastewater injection.

A brief description of the hydrogeology of the southern peninsula of Florida will help in understanding why this method was selected and given tentative approval by the regulatory agencies.

One of the richest water-bearing formations in the world underlies the entire State of Florida and parts of Georgia, South Carolina and Alabama. The system is called the

Principal Artesian aquifer or Floridan aquifer. This might be a misnomer because it actually consists of a series of underground bearing strata of cavernous limestones and dolomites separated by thick and practically impervious layers of marls and dense limestones.

This (indicating) is the southern peninsula of Florida. Here is a cross section. You can see that the whole--and this goes, as I said before, to Alabama, Georgia and South Carolina. It is underlined by this limestone and covered by some type of material which I will describe later.

Deep cavernous strata (usually below 1,600 feet in depth) are highly mineralized in parts of the central and all of the southern peninsula of Florida. These deep beds have been penetrated mainly by oil exploration wells. Drilling through the highly cavernous zones breaks off large fragments of dolomite and limestone which collect, together with debris, in the caves. Such conditions present serious difficulties similar to those experienced while drilling through large boulders. For this reason such strata are referred to as the "Boulder Zone."

This is a photograph furnished by Dr. Vernon's office of a well in the southwest peninsula of Florida about 30-some hundred feet in depth and this is an underground television camera. These are some of those big rocks or boulders that--they are not boulders, but you could call them boulders, and this is a huge cave here (indicating), and the reason why this photograph was taken is because the drilling bit made a twist here and they broke the drilling stem and they had a really hard time trying to finish that job. That is an oil exploratory well.

The boulder zone extends under practically all of central and southern Florida.

These black belts here are points in Florida where either the boulder zone or other highly cavernous zones have been penetrated.

Limestones and dolomites within the Floridan aquifer are overlain by clays, marls, and dense limestone which confine water under pressure. They also form the base of shallow groundwater, including the Biscayne aquifer, the principal source of water in southeastern Florida. The confining beds in this area extend from approximately 200 feet to 800 feet or more in depth.

Normal piezometric heads in the peninsula range from approximately 20 to 30 feet above mean sea level--there we have 20 and here we have 40--near the southern snores to 50 to 60 feet around Lake Okeechobee, and up to 130 feet in the central highlands. The artesian pressure causes wells to flow in practically all the areas around and to the south of Lake Okeechobee where ground elevation usually ranges from 10 to 20 feet above mean sea level.

This is a lake. This is about 10 to 20 feet. We have an artesian pressure here of about 40 to 50, so we have artesian flow.

Now, as I said before, most of the water in the southern peninsula of Florida within the Floridan aquifer is highly mineralized. This is a slide of the quality of the top part of the Floridan aquifer. You can see that here (indicating) your chlorides are less than 50 PPM or milligrams per liter. The green one is 50 to 250. The yellow one 251 to 1,000. And the brown one is over 1,000.

Now, if we make a cross section roughly through here (indicating) on this slide we will get what we have here. This (indicating) is the Gulf of Mexico, the Straits of Florida, Lake Okeechobee. We have about 80 to 100 feet--and this is very generalized; I am trying to simplify it for you--about 80 to 100 feet of the shallow groundwater aquifer. Here in Miami we call that the Biscayne aquifer and this is not as homogenous as I presented. I am trying to simplify.

We have a confining layer between about 100 feet and about 700 feet of marl which is completely impervious. Now, why we know that it is completely impervious is because we have water here in the top part of the Floridan aquifer with chloride concentrations of over 1,000 milligrams per liter with artesian pressure of about 40 feet above sea level that would come up to about here (indicating) and that water doesn't show up here (indicating). We have chlorides in the Miami area about 15 to 20 parts per million. We have here (indicating) about 1,000, over 1,000.

Now, if we keep on drilling deeper we find that we lose the permeable zone about 1,300 to 1,400 feet in depth and then we go into a very dense limestone with no water at all, just like a wall, and then some place around 1,700--we were hoping in Snapper Creek it would be 1,700; here we found it much deeper--you find this highly cavernous zone with chlorides of almost sea water, starts about 10,000. Actually at the very top part here you have about 3,500, but as soon as you start drilling in it it jumps to 10,000, and here in the peninsula we found it about almost 18,000.

By the way, Mr. Chairman, if anyone has a question about any of the slides or anything, please feel free to interrupt.

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Pollution Control does not allow the discharge of hazardous or polluted waters into aquifers whose waters have chloride concentrations of 1,500 mg/l or less. These zones are reserved for future demineralization. For the above reasons, injections were planned into the boulder zone. So this part of the Floridan aquifer with chloride concentrations of 1 to 2 thousand milligrams per liter are reserved for future water supply or demineralization of that water supply. Now, it will be expensive because you have to remove, demineralize that water, but it is there, and then we decided to use this deeper part with much higher chlorides.

Plans and specifications were prepared for the construction of a disposal well to an estimated depth of 2,500 feet in order to determine whether the very permeable and salty limestone aquifer was present at the site and could accept this volume of water at reasonable pressures. The well has been designed to prevent any contamination of the upper aquifers either by waters from the deeper strata or from the effluent discharged into them.

We would like to point out that the disposal well is located slightly over one mile from the new city of Miami Orr Well Field. The Biscayne aquifer, from which the water supply of Miami is obtained, extends to a depth of approximately 100 feet.

It is separated, as shown before, from the top of the Floridan aquifer by an aquiclude approximately 800 feet thick. Water in the top of the Floridan aquifer is brackish and is seldom used in the Miami area. An aquiclude, extending from a depth of 1,800 to 2,550 feet, separates the top of the Floridan aquifer from the Boulder Zone, which is highly saline and ultimately discharges into the ocean depths of the Straits of Florida. Here is a slide of the well being drilled.

Completed disposal well extends to a depth of 2,947 feet and is separated from the Biscayne and Floridan aquifers by three cemented steel casings to prevent pollution of the upper formations. Two aquicludes, comprising a total depth of approximately 1,500 feet, separate the receiving stratum from the Biscayne aquifer.

I don't know if you can see this good there or not. We tried to summarize all the data.

We have the Biscayne aquifer here (indicating) about 100 feet, cemented and cased. Then we have the aquiclude here (indicating) cemented and cased, part of it. When we start hitting some material that was hard enough to keep us out of trouble we put the casing and cemented. And then we have a feathered casing (indicating) through this water-bearing limestone to 1,810 feet, it is a steel casing here (indicating) and we cemented only the bottom part on purpose because we left this annular anus or annular space between the inside casing and the hole made as a result of the drilling of the well as a monitoring purpose.

The non-cemented annulus between 1,678 feet and ground level will allow continuous monitoring of water quality from the top of the artesian aquifer. Any possible leakage from the inner casing, the open hole, or the receiving zone--this is the zone where we have the highest pressure. If we get any possible leakage, this will be the first place it would show up--would develop in the immediate vicinity of the well and could be detected first by monitoring the annulus.

Formation samples were collected every five feet throughout the entire depth of the well. Water samples were collected every 20 feet throughout the artesian water-bearing zones. Field determinations were made immediately after collection for temperature, specific gravity, specific conductance, and chloride.

And here again we have them reported here (indicating). Now, we are trying to be very careful about where we had to seat our casing and also we were interested from an academic standpoint to find out if this 40 feet that we had here reported as artesian pressure was actually true pressure or what it was. When you have a liquid here fluid with a specific gravity greater than freshwater or greater than 1.000, it will give you a false reading on your artesian pressure. So that is the reason that here we made in the field temperature, specific gravity and chloride determinations. The reason you have to do it in the field is because specific gravity changes with temperature, as you all know, and we wanted to be sure we got the correct and true actual information.

The receiving aquifer is a cavernous dolomite and limestone stratum with high-chloride water under pressure. It was reached in this well at 2,920--that was when we really got the flow--and is separated from the upper part of the Floridan aquifer by approximately 700 feet of dense limestone which acts as an aquiclude.

Actually, here at 2,500 is where we started finding some shoals of water, but there was not enough, so we kept on going and here (indicating) is where we got our bulk of water.

It is most interesting to note in this plate, and you can't see it on the slide, but you can read it on the plate in the statement, that our water temperature varied from 74 degrees Fahrenheit at about 1,000 feet down to 61 Fahrenheit at the bottom. It kept gradually going down as we went deeper.

Such a temperature drop is contrary to the normal groundwater geothermal gradient of approximately 1 degree Fahrenheit increase per 50 to 100 foot increase in depth. This temperature gradient anomaly is caused, in our opinion, by heat transfer from the aquifer groundwater into the cold, deep water of the Straits of Florida. Temperatures below 2,000 feet of depth in the Straits range between 45 and 50 degrees Fahrenheit.

Table 1 in the text shows a comparison between the chemical composition of the water from the Biscayne aquifer at the disposal well site; of the water from the disposal well (Boulder Zone); and the average composition of sea water at Miami Beach. Comparison shows that the chemical composition of the water from the disposal well is slightly less mineralized than that of the sea water in the Atlantic Ocean at Miami Beach, but very close to it.

Full cooperation was provided by the Bureau of Geology, Florida Department of Natural Resources, and the Subdistrict Office (Miami) of the Water Resources Division, Geological Survey, U. S. Department of the Interior. Dr. R. O. Vernon, Director of the Bureau of Geology, kept close contact with the engineers in the planning and prosecution of the project.

After completion of the well, a pumping (injection) test was planned to determine:

1. Injection capacity;

2. Pressures at the well head while injecting at different flow rates;

3. Injection pressures at the receiving aquifer while injecting at different flow rates; and

4. Effect of the injection pressure on the annulus pressure (a measure of the head in the upper part of the Floridan aquifer).

Here are the pumps we used for the tests. We were getting water from the Snapper Creek Canal. And by the way, at the request of the Dade County Water Pollution Control Office we had to chlorinate the well going into the disposal well and this was done.

The difference between pressures at the receiving aquifer, that is under 2 and 3 here, and the well head are caused by friction losses through the casing and borehole from the well head at ground level to the injection stratum at approximately 2,930 feet.

That is, we have a hole here, a pipe over 3,000 feet in length, and we have friction, so we want to have the pressure measured here (indicating) at the well head and also at the bottom.

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The way we did this was by injecting a viscometer down to the bottom of the well and this would read off the pressure at the well head independent of friction losses and then the one in the well head was put here (indicating), so we were reading at the bottom P_b and at the well head P_w. This (indicating) was P_a, the pressure in the annulus.

Several preliminary tests of short duration were conducted prior to a final injection test, which started January 27 of this year, 1970, and ran continuously for 26 hours and 21 minutes. Preliminary tests were conducted to check (and correct whenever necessary) pumping equipment, suction and discharge piping, chlorination facilities, and instrumentation.

Results of final injection test are summarized in Table 2 and are here.

Flow rate, gallons per minute, million gallons per day. Duration of the test period in hours, and this was continuous, pressure readings in psi, pounds per square inch, the P_a, the annulus, you remember the other one I showed, well head and bottom.

At 1,050 gallons per minute, 1.51 mgd, we tested for 3 hours, the pressure of the annulus was 16 psi, the same as we had before, well head went up from 31.8 to 35, about

3.2, and the pressure on the bottom went up 1 psi, 31 to 32--31.8 to 32.8; excuse me.

At a flow rate of about 2 million gallons per day, 1.95, tested for 3 hours, the pressure in the annulus remained the same, well head went to 37, pressure at the bottom 1.1 psi.

At 4.4 million gallons per day, 4.46, tested for 17 hours, this is the one that we wanted to take more flow, annulus the same, well head 43, at the bottom 33.

Then we went to 5.72 million gallons per day for 3 hours, pressure at the annulus remained the same, well head 51 and at the bottom went up 1.7 psi.

This, I have tried to plot it here to give you an idea how this is pressure in the well head and this is flow in gpm. When we increase our flow, the pressure of the well head went like that (indicating) because of the friction losses in the pipe. As a matter of fact, if you calculate this, it gives you an average P coefficient of about 110, this for the whole 3,000 feet. This is the pressure of the receiving aquifer which increased very little until we got to about 4,000 gpm.

Results during the test indicated that, after each increase in flow, equilibrium was achieved very rapidly.

Every time we increased flow this point here (indicating) or here (indicating) was reached in a matter of 10, 15 minutes and then would stay the same.

The pressure of the annulus stayed at 16 psi throughout the test. This indicates that no significant leak exists between the bottom hole or the 16-inch casing and the upper aquifer.

The small increase in the injection pressure at the receiving stratum near the bottom indicates extremely high permeability or transmissibility of the formation.

One thing I want to point out to you, one of the misconceptions in deep well injection, is everybody measures this thing at the well head. I think, at least in the literature, I have never found this being done. This was done for the first time as far as I know here in south Florida. And by the way, this was done at the insistence of Mr. Reynolds that he wanted to do it anyhow. I wanted to do it, but I realized that it was going to cost a lot of money, but he said, "Let's go ahead and do it." This gives you that the reading when done at the well head is completely different than what you have down here (indicating). Here (indicating) we are getting pressures of 52 pounds, here was 33 pounds. Increasing pressure here was about 30, here was 3 pounds.

One thing I would like to call to your attention is the fact that although the static pressure in the well head or in the receiving aquifer was 31.8 psi (referred to the top of the 22-inch casing flange), it does not necessarily mean a higher piezometric nead than that of the annulus, 16 psi. The specific gravity of the water in the annulus is higher than 1.000 and varies with depth, while that in the well during the test was slightly less than 1.000 because of the temperature. In order to establish a comparison between piezometric heads, the specific gravity of the water in the annulus and in the well has to be identical for the same column length.

Another thing I want to point out that is not in this text is that our static pressure was here (indicating) about 32 psi. Converting that into feet is about 70-some feet. You remember that piezometric map that we had here in Florida,it only showed 40 because those figures are measured with the aqua water that you find over there that is not 1.000, but it is slightly heavier, and that is the reason why we had about 16 pounds in one in the annulus and 32 when we injected fresh-water.

The safe operation of a well disposal system not only depends on favorable hydrogeological conditions, careful design, and completion of the well itself, but on the supervision of its operation. A comprehensive system to monitor the operation of the disposal well and any possible effect such operation may have on the groundwater quality of the upper aquifer (artesian) and that of the shallow Biscayne aquifer (water table) has been designed and includes surveillance of:

1. Quality and pressure of the fluid being injected into the well;

2. Quality and pressure of the brackish water in the upper aquifer (artesian);

3. Quality of the freshwater in the shallow Biscayne aquifer, under water-table conditions.

The best location to monitor the quality and pressure of the upper part of the Floridan aquifer is, as I said before, at the annulus between the inner and middle casings. This will allow for the quickest detection of any leakage through the cement seal at the bottom of the inner casing or through the casing itself. In addition, any upward leakage through the 700 feet or more of the dense limestone overlying the receiving aquifer would have a greater tendency to develop near the well itself, as this is the point of highest pressure increase caused by the injection.

Surveillance under 1 and 2 will be made by continuous and automatic recording of the following variables:

Effluent flow to well, that is waste flow to the well.

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We are going to measure flow rate, injection pressure, chlorine residual, pH, DO, specific conductance, turbidity.

The stream from the annulus is going to be continually flowing and we are going to measure there. It is going to be a very small flow, by the way, it is not going to affect the pressure, and we are going to measure there the pressure and the specific conductance.

The system will provide a visual and audible alarm plus injection pump shutdown for variables marked above with an asterisk in the event any one of them exceeds or falls below the limits established by the regulatory agencies.

Surveillance of the quality from the freshwater in the shallow Biscayne aquifer will be done monthly by complete chemical and bacteriological analyses on samples from a shallow well 320 feet southeast of the injection well.

Conclusions:

Properly designed, constructed, and operated well disposal systems, discharging into saline aquifers, offer a solution for the disposal of treated sanitary wastewaters in those areas where hydrogeological conditions allow such a method. Furthermore, these systems must be considered as an asset to the freshwater pressures of the area. They actually constitute a method of artificial recharge.

MR. STEIN: While you are there, Doctor, let me interrupt, because this is a part I didn't get. I can't understand how you are going to have a recharge if you are going down to that Boulder Zone if the water we are using for the drinking water supply comes from a much higher strata. How do you figure we are going to have a recharge? Doesn't this water go right out to the ocean and it is just a question of economics whether you pipe it or put it down there?

DR. GARCIA-BENGOCHEA: Mr. Chairman, I think your question is answered in the next two paragraphs.

MR. STEIN: All right.

DR. GARCIA-BENGOCHEA: If you are not satisfied with those paragraphs, come back to me.

MR. STEIN: No, that is all right. I thought you were up to the conclusions.

DR. GARCIA-BENGOCHEA: Well, the conclusions are--

A recently completed disposal well immediately south of Miami, Florida, is an example of such a disposal-artificial recharge scheme.

The treated wastewater has a lower specific gravity (approximately 1.000) than the high-chloride water in the aquifer (approximately 1.025). Actually we measured 1.027 in the well. Mixing will occur at the very beginning of the injection period and thereafter a freshwater bubble will develop, floating on the saline water and limited above by confining layers. This is based on the well-known Ghyben-Herzberg principle, which explains the relationship between fresh and salt water in coastal areas. This principle allows for the recharge of freshwater into salt- or brackish-water aquifers. Recharge into a brackish water aquifer is being experimented at this time by the U. S. Geological Survey in central Florida.

I don't know whether this satisfies you or not, Mr. Stein.

MR. STEIN: I see what you are getting at. Do you have any idea how long this would take?

DR. GARCIA-BENGOCHEA: That is in the next paragraph. (Laughter.)

MR. PATTON: Murray, you just ask questions a paragraph too soon.

DR. GARCIA-BENGOCHEA: Injection of the freshwater effluent into the deep artesian aquifer of south Florida will lead to the formation of an enormous freshwater bubble at the top of the Boulder Zone under artesian pressure. Such a volume of water could be used for irrigation or for future water supply when shortage of present freshwater sources would justify cost of reusing the stored water. While such water is not used it will be moving at a very slow rate toward the surrounding seas, entering into them at considerable depth (probably more than 2,500 feet) and far away from the shoreline,we estimate about some 30 miles or more.

MR. PATTON: You say a slow rate. What do you mean a slow rate?

MR. REED: He is going to get to that.

MR. PATTON: O. K. Next paragraph?

DR. GARCIA-BENGOCHEA: I think that is in another paragraph. (Laughter.) It took me quite a while to prepare this and I tried to make it as brief as possible, but there are some things I could not delete.

MR. REED: You had better speed read here.

DR. GARCIA-BENGOCHEA: Two of the misconceptions held by opponents of well disposal are (1) that such a scheme is based only upon underground storage; and (2) that with the exception of some wastes (such as radioactive), the offensive characteristics of the wastes are unchanged. Modern hydrology teaches us that aquifers not only store but also transmit water, and that with some exceptions most aquifers are under a constant but very slow rate of groundwater flow. Basic sanitary engineering teaches us that unless toxic substances are present, anaerobic bacteria (groundwater does not normally have dissolved oxygen, and this one certainly doesn't have) will biodegrade organic compounds.

One question you may ask at this time is: Where does the injected water go? Present technology does not yet offer a practical and economical means to directly determine the direction of groundwater flow at considerable depth. Present knowledge of hydrogeology gives us, however, good indications of what would happen to the injected fluid.

First, we need to realize that groundwater moves in accordance with the hydraulic gradient, following a direction perpendicular to the piezometric contours. If the piezometric surface of the Boulier Zone resembles, as it should, that of the upper part of the Floridan aquifer, the direction of groundwater flow in Dade County is toward the Straits of Florida in the Atlantic Ocean.

Actually, at the completion of the well we measured the well head with the well bore full of salt water and we had between 4 and 5 feet of salt water head above the Straits of Florida or the Atlantic Ocean.

We must consider that groundwater movement in the Floridan aquifer is very slow under natural conditions. Groundwater velocity in the Floridan aquifer of central Florida--and this is the only actual data that we have; they took a long time to do it--has been estimated of the order of 20 to 30 feet per year. And when I say of the order, that means that it would not disturb me to see that this velocity instead of 20 to 30 feet per year is 200 or 300 feet per year or 2 or 3 feet per year. It is in that order of magnitude, average of 20 to 30. Under such conditions, 20 to 30 feet per year, it would take approximately 200 years for a particle of water to move one mile, or 7,000 years for that particle of water to move from the Coral Gables well to the deepest part, or trough, of the Straits of Florida at the latitude of Miami. This is the trough right here (indicating) and we injected right here (indicating).

The trough is approximately 2,600 feet in depth and 35 miles east of our well location. We believe that the Boulder Zone in the Dade County area breaks or leaks through the continental shelf at such a point in the Atlantic Ocean. An idealized cross-sectional view of the geology of Florida gives a clear picture of our statement.

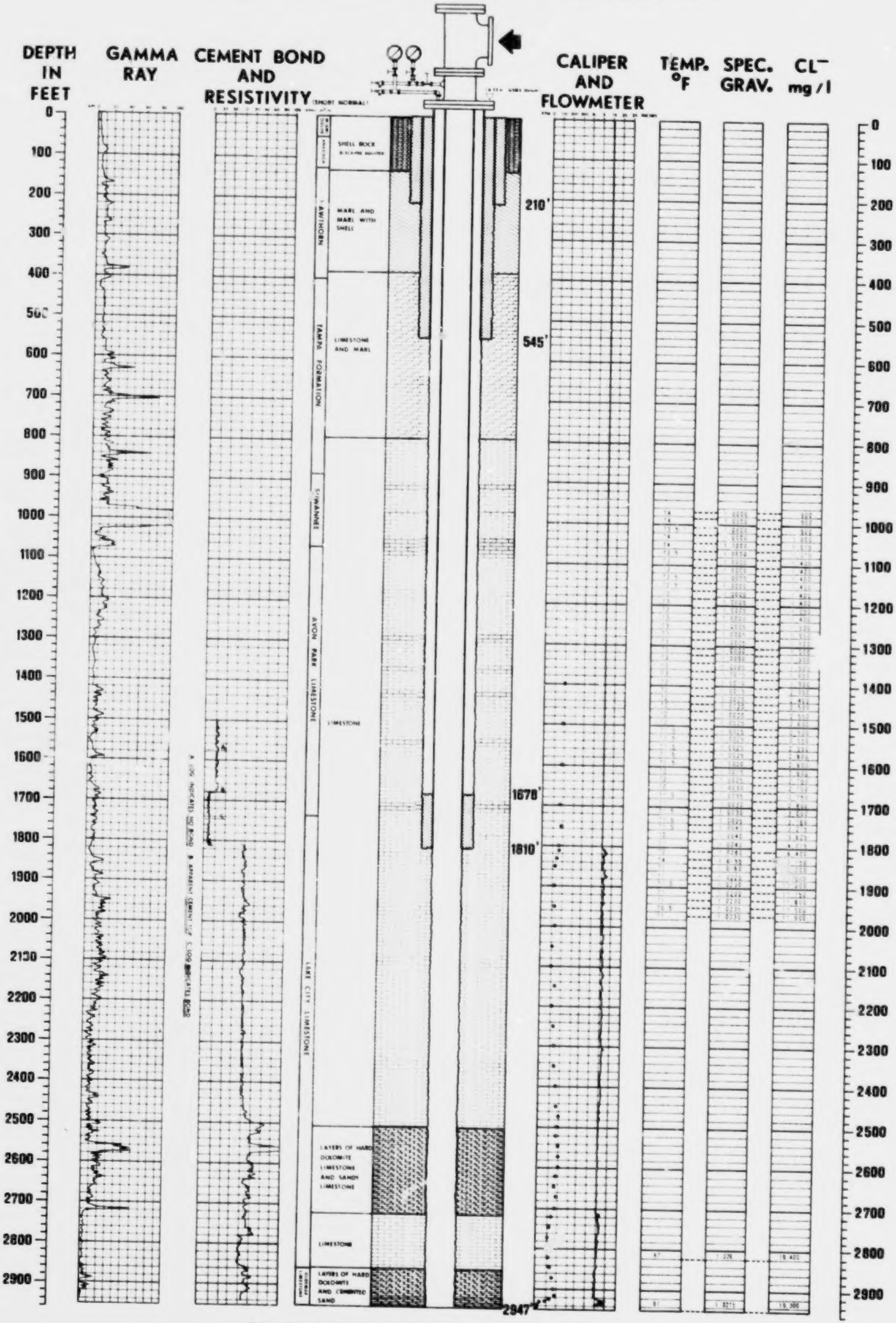
By the way, this is a very nice cross section and I took that drawing there from the atlas of Florida. And in the same atlas of Florida, which is published by the University of Florida press, it was prepared by the late Dr. Raisz, they have this drawing of the hydrologic cycle, which is very useful here to show our point.

This is the recharge area and the aquiclude and springs and swamp, but these are the main things--an aquifer well, the impervious aquiclude, the Biscayne aquifer, and this (indicating) is the top of the Floridan aquifer and you see these things outcropping here, ocean spring. Actually the Boulder Zone is further down and you would have to approach the outcrop further down the road.

One last word of caution, because--I want to emphasize this--I do not wish to sound like an emotional proponent. Not all areas offer favorable conditions. A good knowledge of the local hydrogeology is fundamental. Drilling and testing is the next step, to be followed, if successful, by sound design of the installation and of a reliable monitoring system. Strict regulations and surveillance by a responsible agency are mandatory. This agency should also have,in our opinion, the authority to plan and manage the total water resources of the region.

(The plates and tables referred to above are as follows:)

SUMMARY OF DATA FROM DRILLING AND RELATED OPERATIONS
DISPOSAL WELL, PENINSULA UTILITIES CORPORATION, CORAL GABLES, FLORIDA



Blue Shading Indicates Water Bearing Formations

Plate 1

TABLE 1

COMPARISON OF CHEMICAL ANALYSES

Constituent	Biscayne Aquifer (1)	Disposal Well (2)	Sea Water Miami Beach (3)
Total dissolved solids	285	33,900	35,800
Chlorides, as Cl	11	19,300	19,770
Sulfate, as SO_4	18	2,660	2,750
Bicarbonate, as $CaCO_3$	212	117	121
Calcium, as $CaCO_3$	228	1,140	1,120
Magnesium, as $CaCO_3$	20	5,320	5,430
Sodium, as Na	ND	10,800	10,970
Potassium, as K	ND	415	429

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(1) Biscayne aquifer, shallow well at Sunset Park Plant, 73 feet deep, November 6, 1969, analysis by Black, Crow and Eidsness, Inc.

(2) Peninsula disposal well, 2,947 feet in depth at Sunset Park Plant, December, 1969, analysis by U. S. Geological Survey.

(3) Sea water, average composition at Miami Beach, as reported by Parker, et al., 1955. (U. S. Geological Survey Water Supply Paper 1255, Table 65, p. 572).

ND--Not determined.

conducted to check (and correct whenever necessary) pumping equipment, suction and discharge piping, chlorination facilities, and instrumentation.

Results of final injection test are summarized in Table 2 and are graphically shown on Plate 2.

TABLE 2

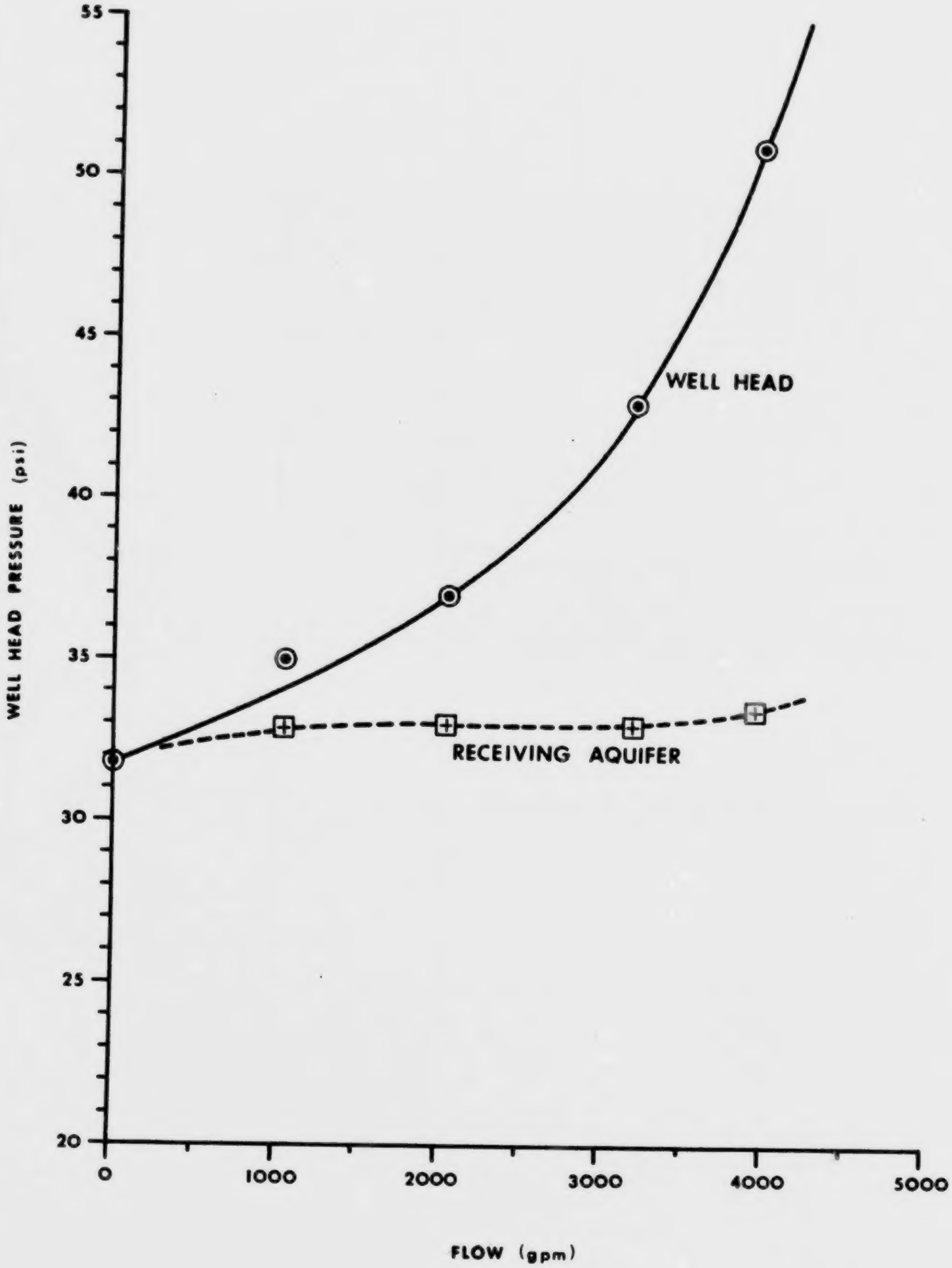
SUMMARY OF INJECTION TEST DATA

Flow Rate		Test Period hours	Pressure Readings in psi		
gpm	mgd		P_a Annulus	P_w Well Head	P_b Bottom
0	--	--	16	31.8*	31.8
1,050	1.51	3	16	35	32.8
2,050	1.95	3	16	37	32.9
3,100	4.46	17	16	43	33.0
3,970	5.72	3	16	51	33.5

*From P_b under static conditions

Note: All pressures are referred to top of 22-inch casing flange which is approximately at land surface level.

Results indicated that, after each increase in flow, equilibrium was achieved very rapidly. Annulus pressure P_a, remained constant at

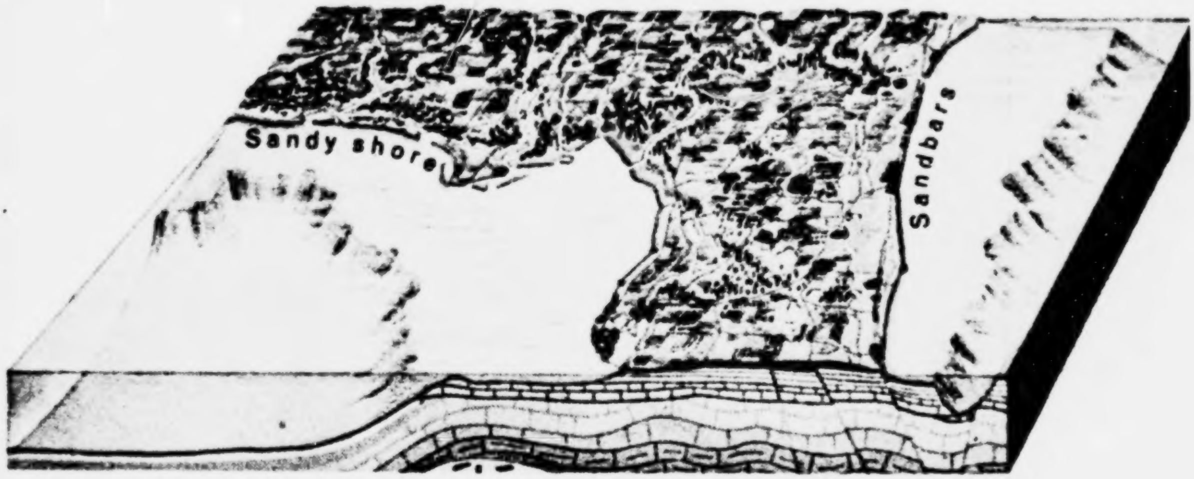


INJECTION PRESSURES vs. FLOW RATES

Note: All pressures are referred to top of 22-inch casing flange.

DEEP DISPOSAL WELL
PENINSULA UTILITIES CORPORATION
CORAL GABLES, FLORIDA
BLACK, CROW AND EIDSNESS, INC.
Engineers

Plate 2


Sandy shore
Sandbars

Idealized Geological Cross Section Of Southern Florida

(Raisz, 1964, p 6)

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MR. STEIN: Thank you, Doctor.

May we have the lights?

In order to save time, can we have that slide back at the beginning where you had all those layers?

No, way back at the beginning of the pictures.

There you are. O. K.

Now, the point is that where we-- What layer are we getting the drinking water from now, the potable water supply?

DR. GARCIA-BENGOCHEA: Right here (indicating).

MR. STEIN: Right there, O. K.

DR. GARCIA-BENGOCHEA: This is the Miami area (indicating).

MR. STEIN: Right.

DR. GARCIA-BENGOCHEA: And our wells, they go (indicating).

MR. STEIN: Right. Now, the question, I think, that the conferees have to face is this, that considering geologic times, if we are thinking in terms of water recharge and we take the wastes and we put them down into that layer you have way below, below those impermeable layers into the Boulder Zone, to all intents and purposes for the next several hundred years we are not going to replenish the water supply we are getting water from except as you indicate we might at some future day have an emergency here to tap this for irrigation or something of that kind.

I didn't mean to be funny when I asked you the question, but what I was looking for and possibly hoping for a little more is that I am not sure this scheme gives us a method of replenishing the water zone that the people in southern Florida are using for their potable water supply.

DR. GARCIA-BENGOCHEA: No, sir, it does not--the Biscayne aquifer. However--and this is something that, as I mentioned in the text, is presently being experimented by the USGS in Orange County. They are injecting water in the tropical part of the Floridan aquifer with chlorides of about 600; we are injecting freshwater with chlorides of about 50. I say "We are," because we asked the USGS to do this for us, and it is a co-op study. Actually, the USGS asked us if they could do it, let's put the record straight, and we wholeheartedly support it. We injected this chloride with about 50 parts in this area, and we are getting back between 60 and 75 percent of the water we inject here (indicating), the next day if we want it.

MR. STEIN: Oh, sure, you can do that. By the way, again I don't want to mislead you, sir, because you have to recognize in the water field, we do a lot of work, particularly in the West and the Southwest. The Interior Department is pretty well known out there, and I am very familiar with well drilling, oil wells, recharging, irrigation wells, and so forth and so on.

The point I am making, though, that with the shortage of water we have in the Southwest, if we can ever put something underground and pull it up again and not have that transpiration loss, we would be well ahead.

But, sir, we are still really in the experimental stage with that. I think if we are thinking in terms of a master plan for treatment here, I do not see with what we have left that we have a recharge system which is going to replenish your potable water supply. You may have an alternate method of disposal to the sea and this may be based on economics, but I don't think that we really have in the foreseeable future that we have to live with or the people in south Florida are going to have to live with here, if we go down to this deep well injection or this underground strata injection, that we are going to have a real large body of water for immediate use for your water supply in this area.

DR. GARCIA-BENGOCHEA: Mr. Stein, if I may, Florida is like every place else. There are some periods of the year we have an excess of water and there are some other times of the year when we have a shortage. Usually the shortage is in May, April and March sometimes.

O. K. Now, I agree with you 100 percent, there is no doubt that we are not putting the water here where we are getting our freshwater, but this is presently recharged by the flood control district canals.

Now, if we need more water than that, we have to study two things. One, in order to put water in the Floridan aquifer and meet the Department of Air and Water Pollution Control standards, we have to give that water tertiary treatment, no question about it.

MR. STEIN: Right.

DR. GARCIA-BENGOCHEA: Now, if we put that water here and leave it there for several years or even a year, I would like to see what happens, because, as I point out in the paper, we have to investigate what is going to happen with the phosphates and the nitrates. The phosphates, we are almost sure that it will flake in the limestone, but of course this is a theory. Now, if we need supplementary water, the only thing you have to do is, in another well nearby where the freshwater involved is already taking place, to let that water flow back.

Now, water resource planning requires a lot of time. That is the reason we think that water resource planning and water pollution control should be under one agency.

MR. STEIN: But, sir, I think we are at a point of agreement. As far as tertiary treatment or the removal of phosphates, if you had an ocean outfall going out deep enough, aside from the water recharge theory, you would achieve the same result. In other words, presumably neither Florida nor the Federal Government would ask for as high a degree of treatment if you were going to put it out in an ocean outfall as if you were going to recharge it to a water aquifer, a drinking water aquifer.

So in other words, what you are really suggesting is that this is an alternate method for ocean disposal with the possibility in the very, very long range, and possibly geological ages, that this water may be tapped sometime in the future for a water resource that we can have. And when we are speaking in that time span, sir, I submit to you that we have a water strata higher up there, true, with a lot of chlorides, and the technology may be such that we will be able to meet water with those chlorides if we are speaking about two or three hundred years from now.

In other words, I see the advantage of this plan as being an alternate method of disposal, but it doesn't really answer our water recharge problem in south Florida today.

MR. PATTON: Doctor, what is the capacity of that upper aquifer, not the Biscayne but the Floridan aquifer itself?

DR. GARCIA-BENGOCHEA: Here you can get wells of three, four MGD, so--

MR. PATTON: Could you put down, let's say, 10 to 20 million gallons a day and expect it to accept it?

DR. GARCIA-BENGOCHEA: This one here (indicating)?

MR. PATTON: Yes, sir.

DR. GARCIA-BENGOCHEA: Anyone with a well--well, here we have a well we are putting in about 5 million gallons per day, we could put 5 million gallons per day. The intentions are only to put 3 or 4.

MR. STEIN: What is the capacity of that Boulder Zone for accepting a quantity of water? Supposing you could build not an infinitum of wells, but you have a large area and you could punch down as many wells as you wanted to. What do you think the capacity of that Boulder Zone is?

DR. GARCIA-BENGOCHEA: I would have to stick out my neck a little bit here and I am going to do it; this is a scientific wild guess (laughter.)

The transmissibilities we are getting here (indicating) are as high and in some cases higher than we have here (indicating) in the Biscayne aquifers. I don't think that the city of Miami has many wells that you could pump 5,000 gallons per minute with 2 feet of grow down. They have several, but not all of them are like that. So at least we have the same capacity here (indicating) that we have here (indicating).

MR. STEIN: In other words, you believe you can put a--if you had enough wells and enough material you think you could put down a hundred million gallons a day?

DR. GARCIA-BENGOCHEA: This is my feeling, sir.

MR. STEIN: Could we have that map of southern Florida again to see where that Boulder Zone extends? You have a map showing where the Boulder Zone--

MR. PATTON: The cross section map.

MR. STEIN: Just a map of southern Florida.

DR. GARCIA-BENGOCHEA: I think I know the one. This is it.

MR. STEIN: That is it. How far does the Boulder Zone extend? In other words, that is enough--

MR. THOMAN: The next one, the one with the red marks on it. No, no. One more.

That is it.

DR. GARCIA-BENGOCHEA: The Boulder Zone extended--or the cavernous zone extended over that area, and--

MR.STEIN: The Boulder Zone extends right down to the southern tip of Florida, right?

DR. GARCIA-BENGOCHEA: Yes, it does all this.

MR. STEIN: In other words, if you had a lot of water to put down, you could put it down into the Boulder Zone even though you had a hundred million gallons of water and if it had some salt in it, you would still have salt down there about the same.

DR. GARCIA-BENGOCHEA: I couldn't follow you there.

MR. STEIN: Didn't you say that that water was about the same as sea water?

DR. GARCIA-BENGOCHEA: Yes, sir.

MR. STEIN: Right. In other words, if you took sea water and put it down there it would be pretty compatible and if this zone extends all the way to the southern tip of Florida we may have a wonderful spot to put water down in south Florida if we wanted to get rid of it.

DR. GARCIA-BENGOCHEA. I think so.

MR. REED: Let me turn it around. (Laughter.)

If I wanted to pull up some of that beautiful 61-degree temperature water or some of that 45- and 50-degree temperature water with present technology, how many gallons per minute could I get with a big well?

DR. GARCIA-BENGOCHEA: About the same you pump in, about 4,000 GPM in that particular well.

MR. REED: I could pull out 4,000?

DR. GARCIA-BENGOCHEA: You have to increase the casing a little bit because you have to pump it a little bit, but you could get it. As a matter of fact, just blowing the head--

MR. REED: Could I build a bigger well?

DR. GARCIA-BENGOCHEA: Oh, yes.

MR. PATTON: Or more wells?

DR. GARCIA-BENGOCHEA: It would be better, as Mr. Patton suggested, to put more wells.

MR. PATTON: Just solved another problem.

Let me ask you another question, Doctor. You indicated that you found a temperature of 61 degrees at 2,947?

DR. GARCIA-BENGOCHEA: Right.

MR. PATTON: What would be the expected temperature of a well at that depth outside the Boulder Zone?

DR. GARCIA-BENGOCHEA: Roughly about 90 degrees, 80-some. In Belle Glade we had about 85, a little bit higher. So I would estimate about 90.

MR. PATTON: You say 85 at Belle Glade. That well is not in the Boulder Zone?

DR. GARCIA-BENGOCHEA: Yes, but over there we don't have the heat transfer of the Florida Straits. It doesn't reach over there.

MR. PATTON: So what you are saying, that the Boulder Zone is not uniform under the entire peninsula?

DR. GARCIA-BENGOCHEA: No, it is uniform, but there is some heat transfer, and you see here (indicating) is Miami, Belle Glade is over here (indicating).

MR. PATTON: Right.

DR. GARCIA-BENGOCHEA: So this is quite a distance, it is about 60 miles, so there is not such a--

MR. PATTON: It is losing heat--

DR. GARCIA-BENGOCHEA: Right.

MR. PATTON: --as it moves towards the Coast or towards the Gulf?

DR. GARCIA-BENGOCHEA: The temperature at 1,000 feet was 74 and we estimate 1 degree per 100, 2,000 will be 20 more degrees, so we lose about 94 Fahrenheit.

MR. PATTON: Let me ask you another question. You are talking about water needs. Do you know what the net flow or discharge of canals FCT are?

DR. GARCIA-BENGOCHEA: No, sir.

MR. REED: Let me ask an heretical question. We keep talking about tertiary treatment before recharge, yet we know we have got 400,000 daily users of the septic tank system in this county and about the same number in Broward County and they are using a device that gives 15 percent treatment and here we all are without any spots on our face and we are working in an aquifer that is terribly shallow.

MR. STEIN: Again--all right, if you want to try that.

MR. THOMAN: I think, Mr. Reed, that you have at most places treatment after that, don't you?

MR. REED: No, I am pulling the john handle, out the septic tank, down into the drinking supply, and several hours later somebody drinks it.

MR. THOMAN: Yes, but I think the water goes through some treatment, doesn't it?

MR. REED: No.

MR. STEIN: Septic.

MR. REED: Oh, you mean for drinking?

MR. THOMAN: Yes.

MR. REED: Yes, they are chlorinating it. You can taste that upstairs in the hotel room.

But Mr. Thoman, you still want to be treating your water.

MR. STEIN: Here is the notion I again have on this. When you are dealing with large amounts of water, like I said, the Doctor can tell you this, really in dealing with wells like this you have a kind of problem where you have to worry about plugging up holes in the pores. You have to have a compatible zone which will accept this, as he has in the Boulder Zone with open cavities.

Now, when you have a septic tank you have a multiplicity, vast multiplicity, of relatively small sources with relatively small discharges hitting a permeable zone where a good deal of the material gets picked up. Once you switch that and you get down--and he has done a very good job on his well opening--the thing he finds right at the other end of that well is an open space where that water is just going to rush out. In large quantities where you are not going to have this we have a very, very different situation.

MR. REED: I got it. Thank you.

DR. GARCIA-BENGOCHEA: Sir, if I may add one point to this, as I said before, and in spite of what everybody says today, I think that engineering is a matter of economics--a responsible economics. In the Boulder Zone we can put water with secondary treatment only. If we go to tertiary treatment, I think Mr. Patton gave this morning a figure of about $60 million to treat the--

MR.PATTON: Dade County.

DR. GARCIA-BENGOCHEA: --Dade County water. If you go to tertiary treatment, you are talking about another at least three times that 60,about $180 million more, plus about three times the operational cost of secondary treatment.

MR. STEIN: By the way, if that is your point, Doctor, I think this is something we have to look at, and I am asking the rest of the panel to look at this. I think you very well may have a point--that you may not have to provide tertiary treatment if you go down into the Boulder Zone. I think,though, I would suggest before you move on this on a large scale that we have this checked out a little more. I think your theory, your supposition, I would guess--I would put my money on you, I think you are probably right. But whether the phosphates are going to flake off and be absorbed or whether the remaining bugs are going to die under there, whether the other nutrients are going to be rendered innocuous, are something that we have to check out. That can be checked, and that may save a lot of treatment on top.

(Off the record.)

MR. STEIN: Let me just finish this for the record and maybe you can go on because you stopped.

I would suggest, before we embark on a program of putting extensive amounts of treated wastes into any underground acquifer and say we didn't need this or that phase of treatment, that we check that out very, very, very carefully to be sure that it won't have any ill effects.

The difficulty with an underground acquifer is once you made the mistake, you are going to live with it for ages.

MR. PATTON: Mr. Chairman, may I comment briefly in response to that?

On May 11 of this year the Board received and adopted a policy statement on drainage and deep wells, and the best way that I can summarize it is to proceed on an individual basis with extreme caution, engineering each step as you go. And I don't know any more cautious way to go. I guess the only more cautious step would be to say no wells at all.

MR. STEIN: Right.

Are there any other comments?

MR. BALJET: Yes, Mr. Chairman, if I may, inasmuch as we are talking about this method of waste disposal. There is a method that has come up in the past, and since we are talking about this, possibly we can have the information right now.

On page 20 of your report, Dr. Garcia-Bengochea, you state that, "Mixing will occur at the very beginning of the injection period and thereafter a freshwater bubble will develop." This in fact is not really a freshwater bubble, is it? It is treated sewage. Whether it be 90 percent or 80 percent, it will have a certain BOD to it, and in this environment is it not true that we could have anaerobic decomposition take place and a formation of a methane gas bubble, which through instances possibly may explode or have other deleterious effects upon the underground strata in that location?

Do you have any information there?

DR. GARCIA-BENGOCHEA: No, but I think your question is very, very good,and I am glad you brought it up. And I pointed out in the paper here that whatever organic matter you have left over there will biodegrade under anaerobic conditions, and you are going to have some amount of methane and some amount of hydrogen sulfide, where both of those things are gases. And I think that you and I know very well that gases are very easy to get rid of. As a matter of fact, it is one of the least expensive constituents in the water that you can get rid of.

Now, you have to use your head and know how to do it, but both methane and hydrogen sulfide--as a matter of fact, in

Florida we have all over the place; the only thing, you just aerate it, store it and chlorinate it and put some polyphosphates. So that doesn't worry me.

MR. STEIN: You know, Doctor, that in southern Indiana, I guess to this day, they are not getting rid of that. Sometime when you are around there you may drink the water. I am not saying you can't get rid of it, but they just don't. (Laughter.)

DR. GARCIA-BENGOCHEA: We do out here in Florida all over the place, and it is the most economical treatment method.

Now, one last remark I want to do. I agree 100 percent that we have to--and with Mr. Patton I agree too--that we have to go step by step. And I am glad that you are here, because this is a point that we need the cooperation of the Federal Government, because these schemes are expensive. That will cost, I think Mr. Reynolds quoted this morning, $320,000. Now, we found somebody that would pay for it. We can't do it.

In another instance in the city of Sarasota, which also we believe is in the Boulder Zone, we wanted to put an experimental well. However, because of a lack of understanding, a lack of communication, that exploratory program that the city of Sarasota was willing to pay for it was killed.

MR. STEIN: That is where the circus heads for the winter, isn't it?

DR. GARCIA-BENGOCHEA: Right.

MR. STEIN: I thought so.

DR. GARCIA-BENGOCHEA: So we need your cooperation, not your opposition.

MR. THOMAN: Off the record.

(Off the record.)

MR. PATTON: Doctor, one further question, if I may.

What would you expect will happen to the phosphates when you are putting this waste material into a limestone formation?

DR. GARCIA-BENGOCHEA: Mr. Patton, I am not a chemical engineer. However, when I am in trouble I look for somebody who knows about it, and I have asked A. P. Black, Dr. A. P. Black, several times that question and he says, "Ignacio, I think that it will flake." Now, the only way to find out is to put it down there and try it. This is what engineers will believe in.

MR. PATTON: Are you going to try to get some of this information?

DR. GARCIA-BENGOCHEA: If somebody gives the money, I am ready for it. (Laughter.)

MR. REED: No further questions.

Thank you, Doctor. I found that presentation most interesting and most enlightening. I am not dead sure what we are going to do with it yet, but I am very appreciative of the information.

DR. GARCIA-BENGOCHEA: Thank you, sir.

MR. PATTON: Mr. Chairman, I might just comment that I know of my own knowledge that one company gambled on a test well for an installation such as this and it turned out to be the largest post hole in the State of Florida (laughter), so it doesn't always work.

MR. THOMAS: The largest or the longest?

MR. PATTON: Well, either way you want to put it. It is king size, anyway.

MR. STEIN: Well, again, unless the situation has changed, I think probably not in the water business in this area, but perhaps in another area, and you have rather extensive experience with wells, I think if you can generalize about wells in any manner, shape or means, you will recognize are not going to have a 100 percent success. I think in any one of these water fields or oil fields or gas or whatever you have, in dealing with drilling wells you are going to have a relatively high percentage of failure. And the reason for that, as I think Dr. Garcia-Bengochea pointed out, while you can make a generalized statement of the geology of the area, you are putting any well down at a specific point and things may not just work at that point, as wise as you might be and as well as you might think you understand the situation, which does not mean that a well technique is not a way to handle several problems.

But you have to understand that when you are digging into the earth's strata and you are dealing with a theory and an unknown and a prediction, you are bound to be wrong sometimes and you just have to take that with the technique. This is part of well drilling.

Are there any other comments or questions?

Mr. Reed, will you continue.

MR. REED: Mrs. Perry.

MRS. I. E. PERRY, CHAIRMAN
CONSERVATION DEPARTMENT
BEL-AIRE WOMAN'S CLUB

MRS. PERRY: Mr. Chairman, distinguished members of the Board. I feel rather insignificant right now. However, I have a prepared statement and I will read it.

First we thank you for answering the request of Governor Kirk to conduct this conference. This is the second time in only 8 months that you have been invited to our county, and we doubly appreciate your presence. Indeed, gentlemen, our waterways are in deplorable condition. Even as laymen in the field of water pollution we are able to tell that waters in Dade County are not as they are being advertised. Anyone who promotes tourism for Dade County by speaking of its beautiful beaches and clear waterways is, in our opinion, not telling it like it is.

But aside from disappointed tourists, it is the citizens of Dade County who suffer the most. As an example, take the community of Bel-Aire in south Dade. Bel-Aire is a relatively young development with canals throughout the area. The principal canals are Black Creek and Bel-Aire Canals.

When people first bought homes in this area, the water in these canals was beautifully clear. However, this changed as the development expanded and the area increased in population. Our waters became darker and appeared different in general.

Little did we know what was happening, until one day in 1968 officials from the State Health Department made door-to-door calls warning residents not to come in contact with canal water. It was then that we learned water pollution in these canals had reached a point of becoming a health hazard.

We further learned that the sources which had created the situation were sewage treatment plants which, with the sanction of State agencies, were discharging poorly treated sewage effluent into these canals and at times bypassing treatment altogether.

Unbelievable as it sounded at that time, we were told that to discharge sewage effluent into inland waterways was common and acceptable practice with no ill effects to the receiving waters, and that only after the franchise service areas of the utility companies had increased, thereby over-extending their capacities, did the problem of water pollution arise.

Due to the efforts of aroused citizens, Dade County then was given a local water pollution control program and one which in our opinion we need to keep.

By orders of our former Pollution Control Director, the offending companies were directed to enlarge their capacities and implement new methods of treatment. Conditions in our area have improved somewhat, at least they have not worsened.

However, with the rapid growth of south Dade, it seems apparent to us that privately-owned utility companies, although they have enlarged their facilities, in a few years again will have reached their maximum capacities. Some companies at their present locations will have no more land available for expansion. The sludge beds of one company even now are only a few hundred feet from a private school and border onto a residential area.

This brings us to our recommendations, which the Bel-Aire Women's Club hopes you will find worthwhile for considering:

1. That Dade County be given financial aid from State and Federal funds to be used for construction of a county-wide sewer system and to establish adequate sewage treatment plants throughout the county, and to also increase the manpower of our pollution control department, which, as we are given to understand, is greatly understaffed. On numerous occasions we have been told by our county management that funds were urgently needed, although not applied for as we now understand. With the needed funds available, our local government could begin to fight pollution.

2. That a moratorium on building in Dade County be put into effect until proper sewage treatment facilities are available. Working towards this goal, the Bel-Aire Women's Club more than two years ago made the same proposal to the county commission, and in all fairness we must say that the

only cooperation we received was from Mr. Leach. We always felt that an adoption of a moratorium on building would at least keep conditions from getting worse.

3. That you consider the feasibility of limiting population for Dade County.

Gentlemen, we accept the fact that utility companies are not the only contributors to water pollution. We have come to realize the many different causes endangering the freshwater supply here in Dade County. Even we, the complainants, are responsible for much of it.

It is our hope, gentlemen, that you can show us how to improve the conditions, how to continue the development of Dade County, and how to still be able to live in it.

Thank you, gentlemen.

MR. STEIN: Thank you.

MR. REED: Thank you, Mrs. Perry.

MR. STEIN: Any comments or question?

If not, thank you.

MR. REED: Mrs. Perry, we are always glad to see you here. I know you represent a very enlightened and a very crusading group, and we are most appreciative to have you here.

MRS. PERRY: Thank you.

MR. REED: Mr. Walter Wyatt, who is Chief Engineer, Homestead Air Force Base, Homestead, Florida.

WALTER W. WYATT, CHIEF ENGINEER
HOMESTEAD AIR FORCE BASE
HOMESTEAD, FLORIDA

MR. WYATT: My name is Walter Wyatt and I am Chief Engineer at Homestead. I came to the base in 1953 to aid in its construction following World War II deactivation.

According to the original forecast of manpower, a plant capable of treating 1.15 mgd of sewage was required. This plant was then programmed by the Air Force and constructed for us by the U. S. Army Corps of Engineers. Within three years of its completion an unexpected load of 1,255 housing units was placed on it and its effluent shortly thereafter became marginal by today's standards. Although we desired plant expansion at that time, the funds were not available within the family housing statutory limitations. Most of you will recall that back then pollution was not a popular subject at the dinner table nor at congressional budgetary sessions.

Nevertheless, as the fiscal years rolled by it became more and more apparent that the plant would have to be expanded and programming action was soon consummated. Budget success was not instantaneous--maybe Washington had not yet gotten the message about pollution.

Finally, though, our funds were assured and the district engineer from Jacksonville supervised an addition worth about $135,000. It was at this time that a most capable consulting engineering firm told us that the new addition was considerably less than we needed. By then the antipollution crusade was in full force, so with great confidence we programmed for funding for the final addition. This one is worth nearly three times the last, and, hopefully, it will soon be approved. If it is, maybe we will be the first plant in Dade County to return the water to general usage.

Three impressions I wish to leave with you concerning the Homestead Air Force Base:

1. As a Federal agency, we are striving to set the finest possible example and comply with all aspects of the Executive Order concerning pollution.

2. Our plant is now turning out an effluent better than that depicted on page 35 of the FWQA book. Their samples for the year 1969 were taken in the period of February through May and our new addition went on the

line in August of 1969.

(Off the record.)

3. If funds are made available we hope to set up a model sewage treatment plant capable of meeting all the present-day standards and exceeding many of them.

Thank you.

MR. STEIN: Thank you.

Let me ask, when do you expect to have this plant completed?

MR. WYATT: You are so much closer to Washington than I. When will the 1971 budget come through? It will take about--

MR. STEIN: Didn't you make an estimate on this?

MR. THOMAN: The military construction budget has already passed, hasn't it?

MR. WYATT: No. No, it hasn't, neither the construction nor housing budget has passed yet.

MR. STEIN: That may be. But you must have programmed for a specific date, didn't you, that you expected that?

MR. WYATT: We have programmed into the fiscal 1971 budget.

MR. REED: Does that complete you?

MR. WYATT: Beg pardon?

MR. REED: You have programmed into the 1971 budget. Does that complete the plant, 1971?

MR. WYATT: Yes.

MR. STEIN: Will the construction be completed in 1971?

MR. WYATT: If the funds are forthcoming in the near future, we could complete within about one year.

MR. THOMAN: In other words, if you got the money by in January you should be finished by the following January?

MR. WYATT: Just about, good estimate.

MR. THOMAN: We are not going to have any more bypassing and this type of thing down there during construction, are we?

MR. WYATT: I certainly hope not.

MR. THOMAN: I hope not, and I hope that you--

MR. REED: No, no, not "hope not." I have had the "hope nots" with that base commander. There is not going to be any bypassing during construction. (Laughter.)

MR. STEIN: By the way, you know, we are going to enforce that Executive Order.

MR. REED: Sure.

MR. STEIN: And I want to get specific on this.

Do you say that you are going to be completed by January of 1972 with the plant?

MR. WYATT: No.

MR. STEIN: No?

MR. WYATT: All I can say is that if I get my funding on schedule I can be complete then. We never get the--

MR. STEIN: What do you mean by "on schedule"? Do you mean during this--before this Congress adjourns?

MR. WYATT: The military appropriations funds don't ever come the same month any two consecutive years. I have seen them come as early as July, I have seen them come as late as the following January. I can't predict that.

MR. STEIN: We have the same problem with funding, but I would like to ask you these questions. What do you mean by getting your funding on schedule? Will it take you a year after you get your money until the plant is completed? You have no short construction periods here, right?

MR. WYATT: No, no, I am--

MR. STEIN: In other words, if you get your money in December you should be finished by next December, a year from now, is that a fair statement?

MR. WYATT: Plus about a month and a half for advertising.

MR. STEIN: Yes, all right. In other words, what we say is about 13-1/2 months from the time you get your funds?

MR. WYATT: Yes, sir.

MR. STEIN: And I think as an old bureaucrat I should put this in for you, that doesn't mean when the funds are appropriated but when the Executive Department makes them available to him, because--

MR. WYATT: Yes, that is true.

MR. STEIN: --we can't use that money until it gets down to us.

Now, what kind of treatment are you going to have? What are you going to have when you finish this plant? What reduction in BOD?

MR. WYATT: I have been told by my consulting engineer that I can achieve a little better than 95 percent reduction if I can drastically reduce the infiltration in my mains. I am now in the third phase of that project. We have had two television contracts to find the leaks. We just completed the third television contract. Following each one, then we have a period of chemical grounding or other repairs more drastic if necessary.

MR. STEIN: In other words, you would expect to have your infiltration problem solved before your plant goes on the line?

MR. WYATT: Far before then.

MR. STEIN: Yes. Then you would expect a BOD reduction, and let's give you a little leeway here, between 92 and 95 percent?

MR. WYATT: No, sir, if I couldn't stop the infiltration I think I could achieve that. If I can get the infiltration reduced about half a million gallons a day, our consultant tells me that we can make the 95 percent.

MR. STEIN: Is this an activated sludge plant?

MR. WYATT: No, sir, primary, secondary and tertiary.

MR. STEIN: What is your secondary type?

MR. WYATT: And--sir?

MR. STEIN: What kind of secondary treatment are you using?

MR. WYATT: We have the primary and secondary clarifiers and trickling filters.

MR. STEIN: Trickling filter plant and you are going to get 95 percent?

MR. WYATT: No, sir. We are going to just about double the size of the plant and--

MR. STEIN: But even so, are you going to use anything other than a trickling filter?

MR. WYATT: No--yes, we are going to use something else, but I haven't reviewed the final plans and specifications personally.

MR. STEIN: I think we had better-- You know, here is the position we are in. If we are going to ask these people up here around in the subdivisions and the industries and the cities to clean up here, we just can't ask them to do something the Federal Government is not going to do itself. I am not sure from what I see of this program, at least unless I can be persuaded by the other conferees, that I am going to be out in front waving a flag for trickling filters in this area. And the reason for that, I have nothing against them per se, except that I don't think they are going to achieve the kind of BOD reductions that you are talking about here.

The question here is, if you are going to get a 95 percent BOD reduction, are you going to have in addition to that year-round chlorination of the effluent and are you going to have any phosphate or nitrate removal? I don't know if you know the answers to those questions.

MR. WYATT: I don't know the answer to the phosphates and nitrates. Yes, we have chlorination both of the influent and effluent, all the way around the clock.

We also have a program for 10 acres of land acquisition and have completed the plans and specifications for an oxidation pond. We submitted that to Mr. Patton and he sent it to Mr. Leach and Mr. Leach sent word back to our consulting engineer that he didn't want any oxidation ponds, so I have been having some conversations with these gentlemen here about the merits and demerits of going ahead with that. It doesn't matter to us. We are just seeking good advice.

MR. STEIN: Well, let me try to make this clear. And I think in order to resolve this, I would suggest that we go over the Homestead plan of the program very, very carefully, and that includes the Department of the Interior people, the local people, and the State people and us and you people ahd hopefully the Corps of Engineers if they are building and operating on for the waste treatment facilities--or are you going to do it yourself? The Air Force is going to do it?

MR. WYATT: Yes, sir.

MR. STEIN: All right. Then we get together with you and then we get together on very particular specifics, and the specifics will be someone's answers and engineering terms of the questions I just raised, including BOD in terms of reduction and pounds of BOD released a day, not just percentages, the question of the chlorination of the disinfection you have and the kind of nutrient, nitrate or phosphate removal you have in the plant, and in specifics when we can get this built and in operation and when the contract is going to be let. And I don't think we can do with less.

MR. WYATT: We welcome this type of advice. I might add that the plans and specifications have been submitted and haven't ever been reviewed and sent back, so the door is open for any manner of technical--

MR. THOMAN: You mean it hasn't been reviewed and sent back by my office?

MR. WYATT: I haven't seen it. Have you sent it to--

MR. REED: Well--

MR. THOMAN: Mr. Reed and Mr. Stein, we will know before we adjourn this afternoon what the present status is and have a full report on it, and if it hasn't been done it will be done by this time next week.

MR. STEIN: Thank you very much. I am glad you welcomed our consultation. See me in about a month or two after you have consulted with us and see if it is still as welcome. (Laughter.)

Thank you.

MR. REED: Thanks, Mr. Wyatt. Give my best regards to the base commander. (Laughter.)

MR. WYATT: He wasn't the one that bypassed that sewer.

MR. REED: I know, I just wanted to badger. But I have rarely gotten so mad at that hour of the morning as I got that day. I don't know where he is. I think he is on the top of the North Pole.

Mrs. Evoy.

JEAN EVOY, CONSERVATION CHAIRMAN
TROPICAL AUDUBON SOCIETY
SOUTH MIAMI, FLORIDA

MRS. EVOY: Mr. Chairman, gentlemen of the Board. My name is Jean Evoy. I am a conservation chairman of the Tropical Audubon Society. Today I am speaking on behalf of National Audubon Society, the Tropical Audubon Society and the Audubon Society of South Dade.

The Audubon Society has had a long-standing involvement with and concern for the preservation of Everglades National Park and the creation of Biscayne National Monument. But our concern here today is of a much broader scope; our concern is for the health and well-being of the people of Dade County. It is a sorry fact that overloaded sewage plants, inefficient package plants and poorly treated or untreated ocean outfalls have become a way of life in Dade County. We must realistically face the fact that the county's water pollution problem is rapidly approaching a situation of crisis proportions.

Not only do these conditions constitute a serious health hazard, but they also signify the total misuse of one of our most valuable resources. There is obviously much to be learned about our complex water systems, but with the knowledge that pollution in Dade County's canals has significantly increased during the past year, and with the additional knowledge that Dade County faces a probable water shortage by the mid-1970's, answers must be found. As an essential step in this process, National Audubon Society and the Audubon Societies of Dade County strongly urge that a Regional Master Sewage Plan be formulated and ready for implementation by mid-1971.

The maintenance of water quality in the systems which supply Everglades National Park presents a special set of problems. At the present time the L-31-W system and canals C-111, C-109 and C-110 discharge water in times of overflow directly into watersheds within the National Park. Zoning boundary changes in Dade County have already been granted to allow medium to high density residential development on lands immediately abutting Levee 31. In conjunction, Dade County has approved the development of sewage treatment facilities which would discharge effluent into this canal system.

Treated "pure" water that would be safe for human consumption is not adequate for the park. The chemical additives used in purifying water for human use are lethal to microorganisms essential to the life of the park; the balance of necessary nutrients in the water would be drastically altered. Therefore, recycling of water for human use may have to be isolated from sources of water that supply the park.

I would like to add here as an aside that we strongly support the position that was taken this morning by the Central and South Florida Flood Control District with respect to adding sewage to canals. We were very heartened to hear of that.

In the overall assessment of pollution in Dade County, few members of either the public or private sectors are entirely blameless. It is our opinion that the Federal Government, whose installations are among the most serious polluters in Dade county, should be called upon to lead the way and set the example for a cleaner Dade County.

We listened with interest to the gentleman from the Homestead Air Force Base.

Although we hope that Dade County will immediately proceed to tackle its most dangerous pollution problems and that planning for wise, regional sewage treatment will also be accomplished as quickly as possible, we believe that additional safeguards are needed if the mistakes which have caused the destruction of most of Dade's waterways are not to be repeated and compounded.

While we realize that Dade's construction industry is a vital factor in the economy, we also feel that continued construction beyond the available capacity of present approved waste treatment facilities is a clear and immediate danger to the people of Dade County, both environmentally and economically. We therefore make the following recommendations:

1) That no further building permits be issued for new construction utilizing any septic tanks or septic tank/ drain field systems that would adversely affect the water quality of the Biscayne aquifer, or allow indirect transfer of effluent to any canals or other bodies of water through the groundwater table according to the water quality requirements established by the State and Federal Governments.

2) That no further building permits be issued where a sewage treatment facility would be required by law if such a facility does not already exist.

3) That no further building permits be issued where an existing sewage treatment plant is overloaded or providing

inadequate treatment, or if the issuance of such permits would allow the plant to become overloaded according to the standards of the Federal, State or local authority having jurisdiction.

On behalf of the National Audubon Society, Tropical Audubon Society and South Dade Audubon Society, I thank you for the opportunity to make this presentation.

MR. STEIN: Thank you.

Are there any comments or questions?

MR. REED: Thank you very, very much. That was a very well presented, very well drawn-up report.

Mr. Eugene Scott.

MR. SCOTT: Sorry, I don't have anything prepared. I put a question mark on my card--

MR. REED: Thank you.

MR. SCOTT: --only if I had questions. I didn't realize what the format was going to be.

MR. REED: All right, thank you.

MR. STEIN: Mr. Reed, while the Audubon Society people are still here, let me just make a footnote on this for your long-range thinking.

You talk in terms of pure water, chemical additives used in purifying water for human use may be lethal to organisms; therefore, recycling of water for human use may have to be isolated from sources of water that supply the park.

I have no quarrel with what you are saying now, but I ask you to think about this in terms of a long-range business, this is not to get possibly hooked in with a philosophic, naturalistic kind of view. The point is, I think water is a renewable resource and you heard these engineers. We can do almost anything we want to. We can add fluoride to prevent tooth decay, we can take fluorides out, we can change it.

From a theoretical point of view, as far as I see, it doesn't make any difference to any kind of life if we produce the water artificially or naturally and put it there as long as it meets all its requirements and constituents. In other words, there is nothing magic about natural water coming in because there is no such thing as natural water. It keeps getting modified. And the reason I raise this is I suspect that more and more as we get into water management you are going to find that we have very, very little free and natural water flowing around any more and man is going to have to adjust it to meet these requirements.

So I would just think about that as a long-range proposition. The reason I say this is this can be fundamental later and you are here and just think about that.

Thank you.

MR. REED: I will think about that too. I am not sure I really--

Joyce Tarnow? I have Miss Tarnow down as Co-Director of Zero Pop. Growth. All right.

John Taribo.

JOHN TARIBO

BIOLOGIST

MIAMI, FLORIDA

MR. TARIBO: Mr. Chairman, members of this conference. It is a pleasure to be here once again.

I don't have any written presentation, and besides adding to what has been stated concerning the lack of pollution control in Dade County since I was the pollution control inspector in that office, it is true and I am not going to add any further comments to it.

While I was at the air conference in Fort Lauderdale I found a lady that questioned how much is a life worth, how much is our environment worth? Over and over during this conference we have heard everything is a lot of money, is a lot of cost. Well, gentlemen, I am trying to come into this conference through a back door, not to show how much our environment is worth because I don't know either, but I think how much environment in terms of costs of the relations of our industry in Dade County is worth and if we destroy this environment what will be the cost?

My data I obtained from the Dade County Department of Development.

Considering our fish industry, we produced in 1969 in Dade County shellfish or finfish 3,877,610 pounds.

In our tourist industry we received 7.5 million visitors with expenditures of $2 billion $850 million in Dade County. All our industry in Dade County is tourist oriented par excellence.

Now let's take a look at some other industry. We have a retail industry, which ties to this tourist industry. We have service industry and hotel industry, which also ties to this tourist industry. Our airline industry also ties into this tourist industry. All worth multi-million dollars, every single one of them, even though our environment is worth more than any one of them or groups of them put together.

If we destroy the waters of this community and pollute them, we are also going to be destroying our fishing industry. If we destroy the waters of this community for which the tourists come for fresh air, clean environment, we also are going to destroy that tourist industry, which is worth $2 billion at present. That is what our environment is worth or more.

Our airline industry is relative. We don't have passengers and tourists come into here, airline industry is moving out. We have been told that the jetport is going to bring $50 million to Dade County. Our environment is worth more than $50 million.

So to come to a conclusion, I would like to say I hope that tying together these relative industries to our environment, this same way is how our environment works and operates, because every facet of our environment ties in with each other. We mess one part of it and we set a chain reaction nonstop, in many cases nonretroactive. Once we cause the damage, there is no way to come back.

I have a clipping here from Graffiti says, "Let's raise a stink over pollution." I have another one that says, "Water pollution is dirty pool."

Gentlemen, I second the motion from the Izaak Walton League and the Audubon Society. We must stop this chaotic development in this community until such time as we can provide feasibly acceptable treatment of our wastes.

While I was in Cincinnati in the Taft Center for Engineering training with the Federal Government, one of the things that was brought to my attention was that poor planning and helter skelter zoning cause pollution. Well, gentlemen, that is exactly what we have in Dade County.

The cost to ourselves is minimal. How much is a dollar? A dollar, we can make it, destroy it and make it all over again. We can tear down a city and build it all over again. We can't do that to the environment. We are going to destroy ourselves whether we realize it or not. We are moving at such a fast speed in our wastes, just like our planet earth circumvents the universe, that we don't even realize that we are moving.

Gentlemen, I also would like to show some slides from this area. Some of those will show where our county private industry, our municipalities and our port authority has been lax, to say the least.

Let's stop thinking of everything in dollars and cents. We have got more valuable things in life than just dollars and cents. Everything is considered how much is it worth? Well, my environment is not for sale.

I am quite certain that after you teach your children like I have done and they tell you, "Daddy, that stack incinerator is producing smoke; do something," it hurts like hell.

MR. STEIN: Thank you, Mr. Taribo.

MR. TARIBO: I have some slides I would like to present.

MR. STEIN: Oh.

(The following commentary accompanied the showing of slides:)

MR. TARIBO: This is at the Golden Isles Utilities. As you can see, all kinds of wastes and solids in this area. This is the Oleta River, the only canal that we have left in Dade County which doesn't have a structural water control area.

This is another shot of the same area. This individual from the utility reported that this was out of the pump box. Well, as a biologist, if this is out of the pump box, I must have never been taught well at my alma mater at the University of Miami. This is sewage. (Laughter.)

This is from the Coral Gables Waterway underneath the Palmetto Bypass. This comes from the Community Utilities owned by General Waterworks. That is not good effluent, gentlemen. That stream is ruined.

Here is another, all kinds of pump box, sludge. This area reeks and it stinks day and night.

Here we are in the same Coral Gables Waterway at one of the county's water control structures. This is downstream from the same Community Utility. As you can see, as it cascades over the water structure a great deal of suds become present.

This shows to me lack of treatment upstream.

There is the fact; no need to explain. Those are suds. And if we can see that, there is a heck of a lot more in there.

This is what is apparent at a part-time treatment plant in Hialeah. This is what happens when there is poor treatment or lack of maintenance in treatment plants that are brand new. There is even a little plant growing in the place. They have never been washed down in a long time.

This is Andover treatment plant, also known as the Southern Gulf Utilities, owned by Ecological Science Corporation. I can't see how somebody in the ecological science can be so hypocritical and tell me to combat pollution and turn around and put this into our stream. This is at the chlorine mop-up chamber, final product after they have gone through their treatment. (Laughter.)

This is in the Palmer Lake, tributary to the Miami River. We are receiving here waste from the Ware Aluminum Company, dumps, trash, and as you can see, there is a fish kill in the area if you look closely to the canal bank.

There are some more dead fish. If you want to feel useless in life, if you ever have a chance, and I hope you don't, to see a fish kill and see fishes coming and gulping out of the water trying to get a last gasp of air and looking around and you looking back and feeling useless. You can't give them no air, you can't rescue them out of the water, you can't rescue them like a human being after a car accident, you can't jump into the fire nets from the fire like you are doing here. You are useless. The poor fish keeps on gulping and he dies.

Here, this is Myrtle Grove, some two employees from Myrtle Grove treatment plant. This is right in the yard of one of the homeowners in the area. All that water you see is not rain, it is sewage, raw sewage. They are going and scraping the solids off her yard to make it look pretty.

This is another view of the same. You will appreciate the county vehicle; that was my county vehicle. (Laughter.) But nothing was ever done.

Over and over recommendations were made by the staff for prosecution, not only in Myrtle Grove but throughout Dade County. We had an outright master of deceit who fooled the people of Dade County and this great State of Florida.

Here is our Military Canal, the largest fish kill I can remember since I started working with the Florida State Board of Health in Dade County. We killed more fish in here in a few days than I think in years in Dade County; we killed menhaden, we killed shellcrackers, every kind of sport and game fish you can think of. This is a view toward the base. As you can see, part of their base facilities in the background.

This is the same Military Canal looking toward a water structure into our bay. Terrible.

This, gentlemen, is in Hialeah, Lake Cecil. I reported this canal, before my departure from Dade County over a year ago, and many, many others to be in a complete septic state. Nothing was done about it, very little has been done about it. In very few places we have started to remove sludge out of the canal and put it in a canal bank so when it rains it goes right back in.

This, gentlemen, is by the Dade County Port Authority, Miami International Airport. This is what they promise us in the jetport, the pollution-free facility in the jetport, the latest pollution free. This is what they do today at the Miami International; even today they are not sewered. This is what they put in those waters, wastes, industrial wastes, plating material, degreasers, runoff from the landing strips, grease drippings, everything. They use a good method of treatment. You take a good look toward the culvert and you see a telephone pole. That holds the floating grease and floating material back. That is all they do with it. (Laughter.)

Here is Aerodex, part of that complex in the west end of the port. It is full of grease all over. No matter where you look in that area there is a heck of a lot more, heaven knows what, because we haven't even analyzed for trace metals in the area.

This is another canal in the area of the Miami International Airport. This is the test block cells of Aerodex formerly owned by Pan American. The waste from those cells and when they have oil lines burst under pressure, it all runs into that drainage ditch and in turn to the canals in the area. These canals in this area around Miami International Airport present a very peculiar flow pattern. Sometimes they flow northwards through the Miami Springs area and eventually to the Miami River. Some other times, for unknown reasons to me, they flow southward into the Tamiami Canal, which in turn also goes into the Miami River. This is why, with the contribution from that jetport, I hope it never gets built and I am very thankful to the Federal authorities and our State authorities for taking such a challenge to the State. Even today as it is being reported that it should remain as a training jetport, when we start putting facilities in there and oil and dripping going off of those runways into the stormsewer, that is going to go into the Everglades National Park, we are going to have organic material going into this area.

We have had a scandal throughout the Nation about metals and pollution. This is a dump west of Palmetto. You can see the large amount of metallic wastes in that area. This is a landfill operation, so-called sanitary fill. We can see rusty metal,the refrigerators, lead, every piece of metal you can think of is in there. Maybe we won't do no harm right there, but heaven knows, we might be drinking that lead.

This is another view of the same.

This, gentlemen, is the south Bel-Aire Canal receiving stream of the South Dade Utilities. This, members of the Board, even though you question the ability of the trickling filter plant, which I realize is true, this effluent is coming from a trickling filter plant. Because of good operation and good inside and prompt treatment I must say this trickling plant meets the requirements of Dade County this day of clear water to Dade.

Here, gentlemen, this is not to state that we have air pollution in here. I put it there on purpose. That little child you see there is my son. He comes running and tells me, "Look, Daddy, the incinerator on Coral Gables is smoking again." He also tells me, "Daddy, that is a Ringelmann 5." And you know what? He is right. Pollution control failed to do their job. It took the city of Coral Gables to use again more taxpayer's money to sue another taxpayer's agency in order to bring about closing of the incinerator in Coconut Grove. What do we pay taxes for pollution control in the first place for?

At Lehigh Canal we had an oil spill of bunker seed, the heaviest thickest oil you can find in the business. This after many days and many recommendations for prosecution and on my estimate somewhere from 5,000 to 8,000 gallons of this in the Lehigh Canal, which in turn went into the Tamiami Canal, Snapper Creek, Miami River, not one single piece of prosecution took place. The only thing I am thankful is, just like in the Military Canal, the news media was there and they had cars.

This was erected through the cooperation of the county water control and the flood control district to assist us at the time to control this bunker seed oil firm from going any further into the Tamiami Canal, to maintain it there until cleaning-up operations could be established.

Here I am. If the face looks disgusted, it is because I am.

I heard about temporary facilities in this conference in order to keep up progress and development of our condominiums. Gentlemen, I am tired of temporary facilities. I had them at

Arlen House, I had them when I came in the Merchandise Mart, facilities that were on grand openings. They didn't have the sanitary facilities. They should never have been opened until they have. The county saw fit to it to grant. This is a temporary facility for a Century 21 motel north in Dade County. PPC Pipe. In this place they are dredging the bay and filling with rock and sand. This PPC pipe in some places is two feet off the ground and undoubtedly will break. The reply from pollution control? "We can't keep a man all over Dade County. This is a very large county." It took one reporter from the Herald and one young biologist and it took us very little time to establish Myrtle Grove on this area right here, it just took a little bit of walk and a little bit of decency.

It was the older pipe, also a temporary facility, which broke, so they replaced it with another temporary facility.

This is the big fiasco of Dade County pollution control and the whole county organization when it comes to our environment and protection of the health and well-being of Dade County. This is the Velda Farms, where our county saw fit to exchange our environment, the health and well-being of Dade County, for a piece of pipe, a transmission pipe in the ground. The process right now is that the county is doing the same thing at Community Utilities. They are going to take a piece of pipe and transmission lines and then station some pumps in exchange for our environment. I didn't give them that right; nobody has that right; not even the pollution control officer has that right. Under the code of pollution control, which I am quite well aware of, the only way you can get to do this is through a variance and nobody saw fit to get it either. A well-meaning pollution control officer at the time, with all due respect to Mr. Dennis Carter, who has tried to establish a water and sewer program in Dade County with no monies, quite sincerely, Mr. Carter, I would have had you arrested.

And I also would have gone for your County Manager, Porter Homer. It might have meant my job after he placed a bond with the court system, but it would have been worth it. You had no right. We the people of Dade County and the State of Florida gave you no right--

MR. REED: All right, Mr. Taribo, go on now.

MR. TARIBO: That is it.

MR. REED: All right.

MR. STEIN: May we have the lights, please.

(Applause.)

MR. STEIN: Mr. Reed.

MR. REED: Thank you. I have nothing.

MR. THOMAN: I have a comment here.

We since have received some information concerning the Homestead Air Force Base. Mr. Wyatt, are you still here? I would suggest that you get on your consulting engineers and tell them to get started working and to prepare some plans as to what they propose to do for the additional treatment that is required down there. You may tell your base commander that he will have a letter from me in the early part of next week when I get back from Puerto Rico requesting that he get started on this because you do have money coming, but as I understand, the plans have not been prepared for the additional modifications.

Now, Mr. Stein, for your information, apparently the trickling filter that is in there now is doing about 95 percent treatment, so it obviously is well operated. But some additional things are required and I believe that your consulting engineer is sitting on his--I could use another word--his hands and not doing anything, and I think you had better tell him to get started.

MR. REED: Or change consulting engineers.

MR. THOMAN: Yes. Well.

MR. REED: O. K.?

MR. STEIN: Go ahead.

MR. REED: Dr. Grune.

Dr. Grune?

John Corris?

Joyce Dieffenderfer.

JOYCE DIEFFENDERFER, PRESIDENT
LEAGUE OF WOMEN VOTERS OF METROPOLITAN
DADE COUNTY, MIAMI, FLORIDA

MRS. DIEFFENDERFER: Gentlemen, I am Joyce Dieffenderfer, President of the League of Women Voters of Metropolitan Dade County.

The League of Women Voters of the United States is no stranger to the area of water resources. It was first adopted as a League item in 1956 and our present support positions were arrived at in 1960. They include support of:

1. Overall, long-range planning of water resources development.

2. Managing water resources on a regional basis.

3. Federal financing of water development with cost sharing by State and local governments and private users.

4. Improved coordination between agencies and departments.

5. Procedures that supply information and encourage intelligent weighing of alternative plans.

6. Citizen participation in water resource decisions.

Since 1960, we have been actively lobbying at the Federal level in favor of constructive water quality legislation.

By our very presence here today it is apparent that League has reached at least some of its goals.

As a local League, we are concerned with the deteriorating quality and quantity of our water resources. We are concerned with the obvious threat to public health posed by polluted recreational waterways. We are concerned with the delays, the inaction and the inertia we observe in our local governmental bodies. We are concerned with the friction between local government resulting in great debate but few solutions.

We speak today not as experts but as concerned citizens. We hope that the facts presented at this hearing will persuade you to require those measures of compliance from Dade County which will improve a dangerous situation and keep it from becoming a disastrous one. The problem is, we think, well understood. The business before this community, State, and Nation is now to implement solutions.

We join with other citizens in asking you to act with firm resolution.

Thank you.

MR. REED: Thank you so much for that excellent statement.

Mr. Garrett Sloan?

Let the record show that the Honorable Robert Graham, Representative of Dade County, is here in the audience. Delighted to have you here, Bob.

GARRETT SLOAN, DIRECTOR
DEPARTMENT OF WATER AND SEWERS
OF THE CITY OF MIAMI

MR. SLOAN: Gentlemen, we are very pleased to have an opportunity to try to keep you abreast of what we here in the city of Miami are doing. Our present situation is the first thing that I would like to discuss.

The report published in advance of this conference, a copy of which has been given to all registrants, was prepared in great haste in order to meet a deadline. It is understandable that much of the progress toward the abatement of pollution of the interior canals of Dade County has not been included. Speaking for the city of Miami, we have worked with numerous public agencies to collect their sanitary sewage and thus positively and permanently accomplish the discontinuance of the operation of small treatment plants. Although the report lists each of these as continuing in operation, the following plants have been discontinued, some of them as long as six years ago:

Key Biscayne;

Miami International Airport, that had three plants described;

The city of Coral Gables, including South Miami and also the Veterans Hospital in Coral Gables.

Our Department is presently committed, by terms of a 30-year contract, to receive all sewage from the city of Miami Springs, which is beginning construction of its first sewage collection system.

In cooperation with Dade County, a 4-mile, 54-inch interceptor is currently under construction for completion in August 1971. The purpose of this project is to provide a means of sewage disposal from three existing overloaded, smaller treatment plants situated on interior canals. It will also provide a means of basic sewage disposal for large areas within the city of Miami and completes all required interceptors within the city limits. The investment of $3 million in this project, and the large diameter of the force main, offer tangible evidence of substantial planning and financing by both Dade County and the city of Miami.

We are operating a small isolated sewage treatment plant serving the Miami-Dade Junior College North Campus and an industrial park. Just as soon as we can complete contractual arrangements with Dade County, we plan to have this connected to their North Miami system so that another small plant can be phased out of service forever.

In addition to the efforts of this Department, a similar extension of large interceptors has been undertaken by Metropolitan Dade County, so that an entirely new sewage system can be constructed to serve one-third of the city of Hialeah and the entire city of Opa Locka. Also, two existing overloaded plants situated at Myrtle Grove and Carol City can be discontinued by connecting their sewage with this interceptor facility and construction for this is already under contract.

Returning to the recommendations of the FWQA report, our local efforts here in Dade County have certainly gone a long way toward achieving them.

Future plans:

A recent county ordinance requires that all ocean outfalls be given a minimum of primary treatment, which is approximately 35 percent removal. Subsequently, a State law was enacted requiring secondary treatment, which has been interpreted to mean 90 percent removal. Our plant on Virginia Key is rendering approximately 75 percent removal by employment of the high-rate activated sludge process. Plans are now being made to increase aeration capacity by the installation of a large dual fuel diesel engine driven blower unit and a 50 percent expansion of the aeration tanks. We plan to take bids on the blower unit within three months. In order to meet increased sewage flows, we are planning not only to expand our facilities in a normal fashion, but also to provide greatly enlarged aeration facilities in order to achieve the 90 percent removal now required.

Several months ago we received an inquiry from the city of Miami Beach concerning the possibility of entering into a joint agreement for the construction and operation of facilities to treat their sewage. After responding in a favorable manner, we have not been advised further.

We are concentrating on a large construction program to meet the requirements described above. Fortunately, our operations are generating a substantial surplus in revenues because some $16 million of the original investment is carried by the city of Miami and supported by ad valorem taxes. Our surplus earnings have enabled us to make the major extensions in the interceptor system described above and we are counting on ever-increasing revenues and surpluses to finance the great expansion in treatment facilities required. The "4 Clean Water, Inc." program, which our board has endorsed unanimously, will be most welcome in our efforts to meet these needs. As you may have read in the morning paper, we are trying to obtain the assignment of additional land area on Virginia Key for this purpose.

There is little doubt that the interior canals of Dade County have suffered a great deal with pollution which has been compounded by the necessary impedance of flow by means of salt barrier dams in order to conserve freshwater resources. However, since the preparation of the 1961 Master Plan, both the county and ourselves have sought opportunities to alleviate these conditions. I believe that we have made great progress in this direction. Our next big challenge will be the financing and construction of extensive treatment facilities required to provide 90 percent removal before discharge into the ocean.

And a comment just for Mr. Stein. I can assure you that the complaints you have heard about our Virginia Key operations are really for the birds, with or without diapers. (Laughter.)

Thank you.

MR. STEIN: Thank you.

You know, I was kind of waiting for that, because I saw those comments before and I know we have a lot of ornithologists around here. There must be a different kind of bird over Miami to create these conditions when just a little west in the Everglades you have so many more birds and things are so nice. (Laughter.)

Are there any other comments or questions?

MR. REED: I have a couple of questions.

Are there any raw discharges from the city of Miami into the Miami River or into any other body of water in Dade County?

MR. SLOAN: From the city of Miami into any other body? Not to my knowledge, sir.

MR. REED: None going into the Dinner Key area and none going into the Miami River?

MR. SLOAN: No, not to my knowledge.

MR. STEIN: Go ahead.

MR. THOMAN: Garrett, one thing that bothers me about this is that you paint a rosy picture here that is completely at variance with all of the things that we have heard from 25 or 30 people over the last couple of days here, and you talk about building a 54-inch force main. Let's start with that one. Where is that going to?

MR. SLOAN: That is--well, it begins at Northwest--

MR. THOMAN: I mean where does it terminate?

MR. SLOAN: Oh, it terminates at Palmetto Bypass, which is 77th Avenue, West 77th Avenue, and Flagler Street. It is a half a mile west of the city limits.

MR. THOMAN: Where does the sewage go to?

MR. SLOAN: The sewage will come into our system from that location. The metropolitan Dade County plans to extend a large interceptor system to pick up three existing sewage treatment plants on its interior streams, one of them being Community Utilities, for which a contract has already been made, another being Southland Utilities and another one being Westwood Lake.

MR. THOMAN: But where does the sewage go to, Virginia Key?

MR. SLOAN: It will be going to our plant at Virginia Key, yes, sir.

MR. THOMAN: Which has been alleged to be overloaded?

MR. SLOAN: I would like to discuss that with you.

MR. THOMAN: Let me go on from here just a minute. There is a Federal grant involved on this 54-inch interceptor and as I understand it, I am going to apologize to the people of Dade County, this grant was made some years ago when we did not have the authority under the regulations to assure that there was an operable treatment facility existing before the grant was made for construction of the interceptor. The regulations have since been changed and that project never would have received any Federal funds under present regulations nor will any more Federal grants be made to Miami or Dade County unless there is an operable treatment facility at the end of the pipe. And I don't think there is one here, Garrett.

MR. SLOAN: Well, I have to disagree with you very violently.

At the present time, and we have produced volumious operating records submitted to all the regulatory agencies, we are removing approximately 75 percent of suspended solids and BOD. Now, the present law, as I understand it, there are two laws that apply. There is a county law that requires primary treatment by January 1 or 2 of 1972. That was a county ordinance and certainly we are complying with that because we are removing 75 percent and that county ordinance specifies 35 percent.

And then more recently there was a State law that required secondary treatment, but the definition of secondary treatment was assigned to the Air and Water Pollution Control Department and a hearing was held on that approximately a month ago in Fort Lauderdale, presided over by Mr. Reed, and it was my understanding, and correct me if I am wrong, that the criteria of secondary treatment as arrived at at that meeting was 90 percent. Now, however, that law goes into effect January 1 or 2, 1974.

MR. REED: No. No.

MR. SLOAN: Now, if I am in error, I would like to know it.

MR. REED: No, that is in error. The law stipulates--correct me if I am wrong, Mr. Patton--that you will be in prior to January 1, 1974. And by that definition that means that the Department will immediately establish with you and the other contributors to ocean outfalls. We have already got the city of Miami Beach under order and it will respond on November 2 to give us a time schedule, which will bring you in, I would hope, beating that time schedule of the law easily. That is how I interpret the law and that is how our attorneys interpret the law, I believe. Mr. Patton, isn't that correct?

MR. PATTON: That is true.

MR. REED: Let the record show that he said yes.

MR. PATTON: Sorry.

MR. SLOAN: I would like someone to tell me whether 75 percent removal being obtained now with high reactivated sludge is or is not in compliance with existing law.

MR. REED: It is in compliance with the law, but I go back to the law:

> Where less than secondary treatment is proposed, ocean outfalls with diffusion devices shall be installed to terminate at the Gulf Stream.

You are in violation of that law, 285.02, Minimum Conditions of All Waters, Times and Places.

MR. SLOAN: I have not had knowledge to terminate at the Gulf Stream. This is the first time I have heard of that requirement.

MR. REED: That is three years old.

MR. SLOAN: I personally have raised at times the feeling of a number of our staff that we should have a longer outfall. However, I have been opposed on the grounds that this would be looked on as a subterfuge to be trying to substitute for a higher degree of treatment.

MR. REED: Well, I think we will jump that point now because it is philosophical now with the secondary treatment required. I don't think it really matters at this time to extend the outfall when what we are requiring is a higher degree of treatment. I think that is a good point.

MR. STEIN: Are there any other comments or questions?

You know, Mr. Sloan, generally I am reminded of a very famous Supreme Court case from what I have been hearing here. We get all of these great and glowing reports from you and some of the other local officials here about the terrific job you are doing. Then we get the people coming in here with the pictures and the citizens coming in, and I think a lot of us are not strangers to the area, we can drive around here and look for ourselves.

I think Charles Evans Hughes in a classic case directed, I believe it was, against the American Telegraph and Telephone Company, talked about this in a rate setting case and he said he had listened to an abundance of testimony on the difficulties that the American Tel and Tel was having making its ends meet and therefore they needed more money, and so forth and so on, but the problem was at the end of the year he always found they had these tremendous profits and these large dividends, after having all this trouble how did they ever do this.

Now, if you have got this wonderful program, how do we get all these reports from the citizens and how do they talk about the conditions of the waters being what they are in this area?

MR. SLOAN: Well, Mr. Stein, many of the conditions that have been described here are outside the central Miami service area. I think that is a very fair observation. And the areas that we can serve with our facilities, our Miami facilities, are those, naturally, adjoining the city of Miami. We have taken care of the Coral Gables problem. That plant has been out of service for about 2-1/2 years, the plant that was situated on the Dixie Highway discharging into the Coral Gables Canal, and I think all people who have contacted us, various consulting engineers, and some of them are in this room here, Mr. Telfair, Mr. Buckley and others have negotiated contracts with us to carry off their sewage to a central plant. And we would like to continue to the extent that we are capable of doing it.

I think one of the obvious problems is that this is a huge county and that sewage treatment on a large scale in Miami only began in 1956, which is 14 years ago. It isn't 25 or 30 or 40 years ago. Compared to the development of our water system, we are 20 years behind that, so to speak. And starting sort of way behind in a rapid growth area has compounded the problem of not only keeping up with growth but also catching up with bad situations.

For example, the city of Miami Springs is just now getting the very first sewage system it has ever had and we have a contract with them that as they install the sewers to carry it off. I view this as a solid progressive step in the right direction.

Some years ago the community of Key Biscayne had a small plant which was difficult and uneconomical to operate and we were approached to receive their sewage and we gladly entered into a contract to do that. I certainly am not trying to paint a picture that everything in this county is perfect or rosy, but I do feel that it is only fair to acknowledge that considerable amount of progress has been made and also that with the complete cooperation of county officials in the last four or five years, especially since they have had an active program, that we have jointly worked together laying the groundwork for an extensive interceptor system. We will just by this time next year be achieving a complete interceptor system within the city of Miami. The city of Miami is only about 50 percent sewered, maybe 60 percent now, but it isn't much more than that. And so we started from a low base and compounded by a very rapid growth situation.

MR. STEIN: I think what you are saying is contrary to the experience that we have had anywhere else. If you started this late, you should really have a good system. Our problems in this country, and our most vexing problems with sewage collection, are the ones with the real old cities, and that you don't have here. This is the problem of dealing with old cities where they have these combined sewers, rudimentary systems, difficulties in collecting them, and the fact that you have the new system seems to me that we should have one which is an example for the country rather than something we have to come down on. This doesn't seem to me a disadvantage. You have a tremendous advantage in laying out new subdivisions to do this in a proper way. It is the places that we have to go in under urban renewal and ripping up every street and separating the sewers and going to every gutter in an old tenement or sewage pipe where we really have the nasty problems. And the fact that in dealing with a relatively new development that you have gotten yourself into this kind of shape might take a little talent, it seems to me.

May I make just this last point. This is what I fail to understand. I have never thought where we had a pressing problem, whether it was in education,welfare or environment, that having a surplus was an advantage in a public agency. You mean to say you are generating a substantial surplus--

MR. SLOAN: Well, we are turning--

MR. STEIN: --talking about that with the problem that we have around here?

MR. SLOAN: Mr. Stein, what we are trying to do, we are revenue supported, we have no other source of income in our agency, and we are spending every dime of the funds that we are generating, reinvesting it in the extension of the interceptors and in the pollution abatement program, the enlargement of the plant and other basic facilities that are needed to serve not only our community but adjoining communities.

MR. STEIN: And just one last remark. You talk in terms of a $3 million and a $16 million improvement. And you have the funds. We have heard in other areas of this kind that I mentioned before, I think you are a big league city with a big league problem, that $3 million and that $16 million figure is the kind of money where we just talk about starting in other communities. I think unless you raise your sights a little more, not only a little more but quite a little more in this area, you are going to have repeated visits from us and not just when we are down here on vacation.

MR. SLOAN: Mr. Stein, I am sorry to have misled you. The initial sewage project which was financed in 1952 was a $27 million project, for the city of Miami for disposal only, had nothing to do with sewers and districts. In the late 1950's the city approved something like $10 million for our bond issue and then in the early 1960's, as I recall, another $10 million, and most recently, just this year, I believe in May, there was a $25 million bond issue for just the small collecting sewers in the city. So that is $45 million in Miami alone that has been approved aside from the $27 million program.

Now, I know Mr. Carter will follow me in a few minutes and the figures that he will give you will be, I think, much more to your liking in terms of large scale, large scope expenditures. But Miami alone has $27 million in our program plus at least $45 million since about 1955. So there is pretty close to $70-odd million right there.

MR. STEIN: I admire your candor, but with a city this size and the figures you outlined, I think the facts speak for themselves.

MR. SLOAN: How big a population do you think Miami has, Mr. Stein? I mean it is not two or three million people; it is only between three and four hundred thousand population in Miami.

MR. STEIN: That is right.

MR. REED: But 50 percent of it is still unsewered.

MR. SLOAN: That is correct.

MR. PATTON: When do you expect to have it all sewered?

MR. SLOAN: Well, I would say something on the order of between five and ten years.

MR. STEIN: Let me ask you, sir, just let's put it this way. Let's go back--

MR. SLOAN: Why should--

MR. STEIN: --try to--

MR. SLOAN: I am not--

MR. STEIN: Try to visualize at least the little fantasy we had before about a big league city. Take your basefall and football leagues. What city can you name that has a big league team, and you have this wonderful Orange Bowl and you get on TV, what city of that kind can you say is 50 percent sewered? Name one.

MR. SLOAN: I can't name any that way, but I can sure tell you of many cities that are far behind us on the degree of treatment of their sewage. New York is one of them; Boston is another where we had our meeting, primary treatment, 35 percent, is all that Boston does; Los Anglees, 35 percent primary treatment. You can just rattle off many of the major cities in the country with only 35 percent treatment, Mr. Stein.

MR. STEIN: I notice you didn't put a number on New York.

MR. SLOAN: They have raw sewage going out the entire Lower West Side of New York.

MR. STEIN: And they have a plant, as I indicated, with a date for $220 million committed. Now, if you people were going to do this in Miami, this would be equivalent to having a plant and the money put up to stop your septic tank situation, the part of the city that isn't sewered and the leakage to the canals. New York City sure has this, but they put up the money, they have the ground hogs digging these interceptors which are going to be bigger than the subways, and they have got the plant built and there is an eight-block site on the West Side of New York for this plant, which is going to be tremendous. If we were doing this in Miami, then I think we would have something. But when we talk in terms of another 10 years to even sewer the city, I think this is something that we are going to really have to look at.

In a way, Mr. Sloan, you are putting Mr. Reed and myself on the spot. Do you think we can go back and say, this is what we are going to live with for another 10 years?

MR. SLOAN: First of all, I am speaking out of order for the collection systems in Miami. Our department has charge only of the disposal system. The Public Works Department has charge of the collection and that program. I am just giving you my feeling from my contact with them of what the program is.

MR. REED: Is the surplus generated by treatment used in any way to finance the collection system?

MR. SLOAN: No, it is used entirely at the present time for the extension of interceptors and the enlargement of the treatment plant. Frankly, we have outlined a 6-year program based on using this surplus for that, and with the 90 percent removal requirement that has come up in the last four or five months we are going to have to really dig.

MR. REED: Right.

MR. SLOAN: There is one, of course, bright spot and that is we are very hopeful that the 4 Clean Water program will proceed, because that will make more--

MR. REED: That will help you treatmentwise.

MR. SLOAN: That will make more help available.

MR. REED: Then your collection system,the way you pay for that is another way, through bonding or some other financial matter, is it not?

MR. SLOAN: Yes, front foot assessments is the principal method of the collections system.

MR. REED: I see. One last question to help me on November 2 with the city of Miami Beach. I imagine this is conjecture.

Can you handle that high chloride count sewage?

MR. SLOAN: Our chloride sewage that we are collecting in the city of Miami is in the order of 1,000 to 2,000 parts chloride. I would guess that we could handle it. I don't know why we couldn't. Although we don't know, I don't have any figures at the moment as to what the exact amount of chlorides in the Miami Beach sewage is.

MR. REED: Thank you.

MR. THOMAN: Mr. Sloan, just a couple of questions here, short ones.

At your Virginia Key plant do you get any storm drainage, stormwater?

MR. SLOAN: We get a very small amount of stormwater from several hundred catch basins in downtown Miami. There is a systematic program of installing storm sewers and changing them over. It is not a serious problem, it does not overload our pumping facilities.

MR. THOMAN: But it obviously would probably overload your plant. What I was getting at is in some recent year about what percentage of the total waste have you had to bypass?

MR. SLOAN: We haven't bypassed any that I am aware of.

MR. THOMAN: You mean even during storm flows?

MR. SLOAN: That is right. When we have these heavy rains in September and October, we don't bypass it. But, now, I want to make clear, I am talking about a very small area of downtown Miami where there are some storm inlets tied to the sanitary sewers. I don't want to mislead you. Oh, I don't know if it is two or three percent of the area served, something on that order. But it isn't the typical combined sewer system as we know it in older cities of the country.

MR. THOMAN: Yes, but when you get a high intensity range generally you do have some bypassing.

MR. SLOAN: Wait. There is one thing that saved us a little. These inlets are tied to 8-inch sewers and you can't get but just a relatively limited amount of water through an 8-inch sewer.

MR. THOMAN: In other words, then, they surcharge and the sewage comes out in the street.

MR. SLOAN: No, that isn't what happens. Those few inlets gradually drain down over a period of time, but they do not drain immediately.

MR. REED: What we get is some localized flooding for a very short time.

MR. SLOAN: Yes, it isn't anything of any consequence. This hasn't been a problem and this is, you know, in the most built-up area in town where I think if we were going to get complaints we would have gotten them.

MR. STEIN: Any other comments or questions?

Thank you again. This relates to my other problem of a relatively new city. You sure don't have the problems of New York and Boston in these combined sewers and the amounts they have to handle in their plant. In other words, this should put you people really way ahead.

Also as we heard from the Homestead base, you get something like a trickling filter plant in this warm climate, they can do a lot better than a lot of other places. And I think generally your waste treatment, using any biological process down in this area of the country, is a relatively--I am speaking relatively--relatively simple operation compared to areas where you really have prolonged cold snaps and you get these tremendous variations in temperature in summer and winter when they have to keep this biological process working in these variants.

So I would think that given the natural attributes and the fact that Miami and your whole metropolitan area is a relatively new area that your problems should be simpler rather than more complex.

MR. SLOAN: Oh, yes, we are very grateful for some of the advantages we have.

MR. STEIN: All right.

MR. REED: Let me ask in the audience--I am trying to conclude with Mr. Carter--is there anybody else who wishes to speak prior to Mr. Carter?

All right, Mr. Carter from the Dade County County Manager's Office.

MR. STEIN: Let's have a 5-minute recess, please.

(RECESS)

MR. STEIN: Let's reconvene.

Mr. Reed.

MR. REED: Mr. Carter from the County Manager's Office.

DENNIS CARTER
SPECIAL ASSISTANT TO THE COUNTY MANAGER
DADE COUNTY, FLORIDA

MR. CARTER: Gentlemen. My name is Dennis Carter, Special Assistant to the County Manager.

At the risk of being arrested, I would like to say a few kind words for Dade County. We have heard the other side of the coin. We have heard a complete negative approach to the pollution problems of Dade County, and I am not here to say that everything is rosy. There is a lot to be done, but a lot has been done. And I think it is only fair that this panel hear the two sides of the story.

First of all, I would like to emphasize for the record that Dade County did not receive any notice of this conference. On July 14 Mr. Peter Baljet, who is sitting up there with you, sent me a copy of a news release from Mr. Walter Hickel of September 28. This is the first notice that I had had of this conference being called.

MR. STEIN: Do you want to state that again for the record? It didn't track right. You said on July 14th. Did you mean to say--

MR. CARTER: Excuse me, I meant October.

MR. STEIN: Right. O. K.

MR. CARTER: I am sorry.

MR. STEIN: All right, go ahead.

MR. CARTER: The next day, I believe it was July 15th--

MR. STEIN: No, you mean October.

MR. CARTER: October. I have got the wrong date.

MR. STEIN: I tell you, in the record it looks bad. Go ahead.

MR. CARTER: I appreciate that.

On October 15, which was Thursday, I believe, the story was in the Miami News of the findings on this pollution control report that was presented to you. We tried very hard to get a copy of it. We called Mr. John Hagan's office. We were told they didn't have any additional copies. We even tried the local news media who printed the story. They couldn't give us a copy because, I found out later, they had loaned it to Mr. Garrett Sloan, who was making a copy for himself.

However, Monday morning, that would be October 19th, we met with Mr. John Wakefield, who very kindly got us three copies of the report on a Monday afternoon.

So I apologize for not having a prepared statement, but truthfully we did not have notice of this meeting until, as I said, last Wednesday, and we did not have an opportunity to prepare a statement.

I assume the same is true for the city of North Miami and the city of Miami Beach, because they have been condemned, so to speak, concerning their outfalls and I don't see even the municipality here. I will try to speak for both of them.

Just to give you a little history of what has been done, Dade County became actively involved in a water and sewer program a little over four years ago. At that time the State Board of Health had virtually stopped all construction in the Sunny Isles and North Miami Beach areas;the FHA had refused to grant any mortgage commitments for construction within the city of Hialeah; private utilities were improperly treating sewage; and our canals were approaching the point of total pollution.

Since then we embarked upon a 4-point program, namely:

1) The wholesale service concept, that is Dade County constructing the major water and sewer facilities such as large transmission mains, pumping stations, sewage treatment plants, extension of ocean outfalls and water treatment plants.

2) Providing water and sewer service on a retail basis, that is the assumption of specific franchise water and sewer service areas to provide service to the customers directly on a retail basis.

3) A program of elimination of improperly operated and therefore offending sewage treatment plants by turning these plants into master pumping stations and connecting them to county transmission lines.

4) The policy recently adopted by the County Commission to acquire all 31 privately owned and operated water and sewer utilities in Dade County and to tie them into one publicly owned and integrated county-wide water and sewer system.

In the last four years Dade County has undertaken approximately $32.5 million of water and sewer, but primarily sewer, projects. Last year alone the neighborhood development program, which is funded under the Department of Housing and Urban Development, has provided Dade County with $13.7 million of water and sewer projects for depressed areas, and this is primarily in the Model City area, the Perrine-Goulds area and a small job in the city of South Miami.

In the program that we have implemented in the last four years, we are eliminating nine major sewage treatment plants involving five utilities in the North Dade area, three major utility sewage treatment plants in the west Dade area, and eventually another three major utility sewage treatment plants in the south Dade area. These sewage treatment plants are presently discharging approximately 15 million gallons of sewage effluent a day, much of which is improperly treated, into our receiving canals.

These projects are all being financed through Federal grants, primarily under the Neighborhood Development Program, county general funds, revenue bonds, local borrowing where possible for special taxing districts, and payment by developers of their proportionate costs to provide these services for their developments.

Now if I may, I would like to go to these charts which I have on the wall to show you some of the progress we have made and what we intend to do.

I am going to try to identify these maps by color, but also identify them by name. The North Miami outfall, North Miami ocean outfall, is shown on this map in a blue line. This outfall was constructed and completed in late 1966 and provides pretreatment, that is a skimming operation. I want to emphasize that although that type of treatment is condemned today, and I am not quarreling with the level of treatment that is given or that it should be higher, but I want to emphasize that this was the level of treatment that was approved by all county, State and Federal officials only four years ago. When an ocean outfall discharges into the ocean, although this particular one was not federally funded, it has to be approved. I am just pointing out that although--and I am not disputing the fact that the people in Dade County are demanding a higher level of treatment--that when these facilities were constructed they were constructed with approved standards at that time. What I am attempting to show is that in the period of time that has elapsed standards by demands of the public have increased.

This outfall has a capacity of 30 million gallons a day. The city of North Miami was saddled with a problem that although they only needed about 20 percent of its capacity, the other 80 percent had to be filled. The city of North Miami, going back to that time, was contracting with the city of Hialeah for extension of its ocean outfall to the city of Hialeah. The city of Opa-Locka was likewise constructing a sewage collection system for its municipality and was in the process of building a parallel line to the one that Hialeah was to construct to the North Miami outfall.

Dade County came into the picture and felt that this is the time and the thing we had to get into and get into immediately. Here you had a situation of municipalities planning to develop and construct parallel outfalls, each to serve the individual needs and neither one taking into consideration the needs of the outlying areas or the areas in between. So at that point Dade County made an application to HUD, this was in 1967, for the extension of this North Miami outfall on this point westward to the city of Hialeah.

Now, this being a Federal grant coming from HUD, had to be approved as far as quality of treatment by the FWQA,which at that time was the FWPCA. We were approved for granting of Federal funds for pretreatment in 1967 for the construction of this line. Today this line is about 99 percent complete. We will be completing it with the pretreatment plant located right here (indicating) in the city of Opa Locka in December of 1970 or approximately two months from now.

Here we have a situation where the county and the Federal Government are joining hands on a $3 million project and before we are even complete, because standards have changed in the meantime, the level of treatment that we will be providing at this particular plant is now considered inadequate and we are under orders to upgrade that level of treatment.

This particular line is essential because it is providing for sewage disposal from the west half of the city of Hialeah. I wish to point out that up until now the city of Hialeah has been discharging approximately **8,000,000 gallons** of sewage a day through septic tanks immediately above the ground from where the city of Miami receives its water from its Hialeah water treatment plant.

This was recognized by the State Board of Health to be a real hazard situation and was one of the prime reasons that this transmission line was built and the reason that the city of Hialeah went to a $14 million bond issue to sewer the entire west half of Hialeah. That is everything west of 57th Avenue to the Palmetto Expressway. They have been working with us in conjunction with North Dade line and they will be complete by approximately December 1 of 1970. So in approximately six weeks we will have the west half of Hialeah, which will be discharging initially about 2.8 million gallons a day, previously through septic tanks, will now be discharging through this transmission line with pretreatment prior to discharge into the North Miami ocean outfall.

The next step is for the city of Hialeah to float revenue bonds for the sewering of the east half of Hialeah. Now, Hialeah is a city with a population of 100,000. It is not a small city. Up until four years ago when they started their sewer treatment plants they were the largest city in the State of Florida with absolutely no sewage treatment whatsoever or sewage facilities other than septic tanks and three small treatment plants that serve their area.

Now, I want to point out that there has been testimony brought out today that the Palm Springs shopping center treatment plant is getting inadequate treatment, that the Lake Cecil sewage treatment plant is getting inadequate treatment. These two and one more will be phased out as of December 1 when it is connected to this line.

The Miami Lakes sewage treatment plant has also been brought out as an offender. They are under contract with Dade County to terminate the operation of their sewage treatment plant and tie into this North Dade outfall upon its completion. So initially this line as of December 1 will be serving the west half of Hialeah, the Miami Lake subdivision of four square miles and the entire city of Opa-Locka, pretreating it and taking the sewage to the North Miami outfall for disposal to the ocean.

We now have a Federal grant we received in July, again from HUD, for Federal funds to convert the Myrtle Grove sewage treatment plant and the Carol City sewage treatment plant, Carol City discharging about 2-1/2 million gallons a day of sewage and Myrtle Grove likewise, total about 5 million gallons a day presently being discharged into the Snake Creek Canal with inadequate treatment. We took bids today; at 1 o'clock we received bids on the funds necessary to construct the system. We have the Federal grant, the detailed plans have been completed, we have now received the bids. We will be under contract in the period of two to three weeks and we expect to be completed by May of 1971. So by May of 1971 both of these two sewage treatment plants will be abandoned as such and connected to this line.

MR. STEIN: What is going to happen at the end?

MR. CARTER: I am going to get to that right now.

A condition of the FWQA in approving the HUD grant on the Myrtle Grove line was that this sewage treatment plant, the North Dade sewage treatment plant, had to go to primary treatment.

This we have agreed to do and this we are doing. Again I bring out that was in only July of this year. Since then standards again have increased, the State has now passed a statute that says that we will be at secondary treatment by I believe it is January 1, 1973.

So I am bringing out that although these things that have been brought out are true and that the treatment standards are inadequate on today's level, that these have happened in a very, very short period of time.

Tying into this Myrtle Grove line there is another treatment plant known as the Opa-Locka Airport treatment plant, a small treatment plant but nevertheless discharging to a canal. That will also be connected to this line. So here just in this one system alone we will see that we are accomplishing two of our objectives we brought out in a four-point program. One handling discharge of sewage on a wholesale basis in that we are not the retailers, we do not serve any direct customers in any of the areas that I have mentioned, but we are transmitting the sewage and treating it prior to disposal to the North Miami outfall.

The other aspect is the elimination of the sewage treatment plants. We will be eliminating nine sewage treatment plants in this North Dade area and five of them are major sewage treatment plants.

Two years ago on Motel Row known as Sunny Isles on Christmas Eve and on New Year's Eve there was raw sewage in Collins Avenue because those hotels which had package plants and some of the smaller ones on septic tanks were okayed for about 80 percent occupancy, but when they hit the peak period of 100 percent occupancy the sewage treatment plants overflowed and the septic tanks percolated up through the ground and raw sewage in the streets. This is another reason why we got into this Sunny Isles sewage system. This again was a HUD grant of $319,000.

MR. STEIN: I don't want to interrupt. I'll bet their average performance was great.

MR. CARTER: Well, let's put it this way, HUD came through with the money at that time when we really needed the money. We have now got a gravity system completed and we have tied it into the Sunny Isles sewage treatment plant, which is at this point a pretreatment plant, also discharging into the North Miami outfall.

We have an application before the FWQA right now to upgrade this sewage treatment plant to primary, the design is already being done, and we also have an application to upgrade the Sunny Isles sewage treatment plant to primary treatment.

The city of North Miami has likewise applications with the FWQA to upgrade their two sewage treatment plants to primary treatment.

Up here to the north we have an area known as the Two Seasons, Inc. It is a large development of 8,000 apartment units complete with a country club, and so forth, an $875,000 sewage collection system going in up there, and we have just received bids for the off-site facilities, which will be about $525,000, which will be a 30-inch force main and take the sewage from this development into the North Miami Beach area where it will connect to a county system that was built within the city of North Miami Beach, which in turn connects to the North Miami ocean outfall, receiving at this point pretreatment at its east treatment plant.

I want to point out that ironically the city of North Miami Beach has the largest sewage collection system in the unincorporated area--the largest single sewage collection system in the unincorporated area. And by the way, for those of you not familiar with Dade County, more than half of the 1,250,000 people living in Dade County live in the unincorporated areas.

The largest system is this Myrtle Grove system owned and operated by the city of North Miami Beach that has absolutely no sewers at all of its own within the city limits. Yet the first project that the county undertook was to build a sewage collection system within the city of North Miami Beach. Sort of ironical. The first system we had was in city limits and yet the largest system in the county they own. We built it because pollution does not know municipal bounds and we could care less where the pollution occurs, we go where the need is.

The State Board of Health at that point pointed out the greatest need was in the North Dade area, primarily Hialeah, North Miami Beach and Sunny Isles, and we have reacted to it and we have built the facilities. Sunny Isles is in operation and North Miami Beach is in operation and the Hialeah line or North Dade line will be complete within six weeks.

Mr. Garrett Sloan--well, before I get into that.

Also on this map I want to start to now get into the facilities that we have constructed that are oriented to the city of Miami ocean outfall which has primary treatment and discharges through its Virginia Key treatment plant. I have only highlighted the areas of the North Dade area. I have not gotten into all the smaller projects. These are the big ones that I gave you.

But in the Model City area two years ago, in fact right up until now, we have been confronted with a situation where you have people living on lots which are 40-foot lots, each one with a septic tank and each one with an individual water well. Now, if you can imagine house after house next to each other on 40-foot lots, each with its own septic tank and each with its own water well, you can understand how bad it was and to a certain point still is.

Under the Neighborhood Development Program, again which is funded by HUD, we received last year $13.7 million to build water and sewer facilities within three depressed areas in Dade County, the largest being the Model Cities. In the Model City area, which is bounded on the north by 79th Street, on the south by the Airport Expressway, on the east by the North-South Expressway and on the west by 37th Avenue, we have an area of about 7.3 square miles, of which $9.3 million was spent just in this last year for a complete water collection system and a sewered--rather a water distribution system and a sewage collection system. This has now been completed with a connecting line, 30-inch force main running from the area to the city of Miami transmission line, which ends up, as I have said, through their Virginia Key plant.

We also have another small project known as the LeJeune Terminals area. I say small; it was a $1 million project. This was an aviation oriented area just east of the airport and known as hard luck hollow. It did not have water, did not have sewers and did not have drainage and it was very low land, and every time it rained you had about two feet of water and septic tanks don't work too well in areas that have two feet of water. So they really had a problem. And we created a special tax in this area. It was a completely commercial area and we have now completed and we put into operation within the last couple of weeks the LeJeune Terminals area for both potable water, which is being handled by the city of Miami, sewage collection, which is handled by Dade County, as well as storm drainage. This was a joint venture with the city of Miami.

As Mr. Sloan alluded to earlier, we have also worked with the city of Miami in extending the city's west sewer interceptor westward. Up until now the city of Miami's West Dade sewer interceptor terminates at Northwest 37th Avenue and 11th Street. Under contract with Dade County this 50-inch force main has been extended westward, as indicated by the blue line on this map, to the Palmetto Expressway and Flagler Street. This cost $3 million with Dade County paying two-thirds of the cost and the city of Miami paying one-third of the cost. The city of Miami, of course, has extended it so it can provide disposal from its sewage collection systems which its Public Works Department will build. Dade County's purpose for extending it was threefold:

Number one, we had a vast unincorporated area in West Dade which was ripe for development and which could not be developed without sewers. Just to give you the type of density I am speaking about, there is one square mile here west of Flagler Street between 87th Avenue and 97th Avenue which is zoned for 15,000 apartment units in one square mile. That is the type of density that is going up. So it was to provide for sewage disposal from this 21 square mile area which is virtually undeveloped.

The second reason was to provide for sewage disposal from three sewage treatment plants. One is the Community Utility sewage treatment plant, which you heard from before, which is owned and operated by General Waterworks. Second is the Southland sewage treatment plant and the third one is the Westwood Lake sewage treatment plant.

So here again we are accomplishing a twofold purpose of our program: One, the elimination of sewage treatment plants, and secondly, in this case, providing for sewage disposal on a retail basis, because this is the county service area and we will be serving these people on a retail basis.

Moving now to the South Dade area, we have a development known as the Perrine-Goulds development. That is primarily the area west of U. S. 1 in Perrine bounded on the north by Richmond Drive, on the south by Eureka Drive, and on the west by 107th Avenue. And the Goulds area, which is to the south and bounded on the north by the Black Creek Canal, U. S. 1, on the south by 224th Street, and 112th Avenue to the west.

These two Neighborhood Development areas are depressed areas and the Federal Government, again HUD, put in $4.2 million of water distribution systems and sewage collection systems and it was Dade County's responsibility to provide the off-site facilities. In this particular project we have worked with both HUD and the FWQA for Federal funds for the off-site facilities, with the FWQA agreeing to pay one-third of the cost for the two million gallon a day sewage treatment plant and sewage force mains and HUD paying 50 percent of the South Dade water treatment plant. The initial capacity of this plant will be two million gallons a day, but it is being designed so that it can be later increased to six million gallons a day and will be serving as the nucleus of what will some day later be a regional treatment plant for the South Dade area.

This plant is primarily there to provide the sewage disposal for these two Neighborhood Development areas as well as to provide for the economic development and growth of the South Dade area. I neglected to say that this West Dade line which is going out in the West Dade area is an FWQA project one-third financed, for which we received a $1.5 million dollar Federal grant.

Gentlemen, to keep it short, these are basically the facilities which have been built by Dade County primarily in the last three years, most of it with Federal funds, about $17 million worth of Federal funds, $7 million of county funds, and the balance by revenue financing and contributions from developers.

There has been much said today about the need to upgrade Dade County's master and water sewer plan. I am in full agreement. I know everybody is in agreement and so is your County Commission. The County Commission has recognized this for over a year now and has appropriated in the new budget which took effect October 1 $65,000 as Dade County's share for upgrading the 1961 master plan.

Now, there has also been a lot of talk that the 1961 master plan is invalid. It may be out of date in certain respects, but it is not an invalid plan. For those of you who are not familiar, it was developed for a 50-year period on a decade basis, each 10 years, and it is quite a detailed engineering plan showing the future growth of Dade County and what type of facilities need to be built in what decade as the area grows. Times have changed, 10 years have gone by almost, and primarily your quality of treatment of sewage has changed, requirements have changed and the need for upgrading the master plan is now present. We have the money and we propose to do it.

I might also add that Mr. Lorentzon,of the U. S. Department of the Interior,in a turn before the County Commission assured us in, I believe it was July of this year, that the Federal Government had its share to work with Dade County for the upgrading of this master plan, and now that we have our funds we certainly hope that the Federal Government has its share to assist us in this endeavor, because I can point out right now, gentlemen, I am sure you are all aware, that for Dade County to have a complete sewer system, forget the water part, just the sewers alone, in the presently developed areas will cost between $800 million and $1 billion. This is too much for one area to swallow financially and it can only be accomplished in partnership with the State and the Federal Government.

Now, I noticed that in Mr. Patton's report, which was a very objective report and which I basically agree with, he stated that one of the things Dade County needs to do is to build the county-wide sewer system using county funds, either general obligation bonds or revenue bonds, together with federally financed grants and State grants. I am glad that he included the word State grants, because up until now, as you know, gentlemen, there are no State grants in Florida for sewer facilities or water facilities to any locality.

I understand that the constitutional amendment which is coming up on November 3 will provide for these State grants and I sincerely hope the people of the State of Florida will pass this constitutional amendment, but more important that after it is passed the State Legislature will see fit to fund it, because they have the law on the books but without any money to go with it, it is meaningless, and up until now we have received absolutely no financial aid whatsoever from the State of Florida.

I think the State now recognizes its responsibility and we in Dade County, which is the largest county in the State of Florida, representing 20 percent of the people in the State of Florida, certainly hope that they will now assist us financially. Because with the approval of this package, the Federal Government will be putting up 50 percent of the cost of sewer facilities where up until now it has been a third, it will be 50 percent, but more important the State will be putting up 25. So that means that the local governments will only have to pay the other 25 percent, not 67 percent but 25 percent, and this is very important.

D. Carter

Of course I realize that the entire billion dollar sewering of Dade County cannot all be done on a State, Federal and county sharing. There are certain facilities, such as the laterals that go in front of the homes, and so forth, are going to have to be on a foot front assessment. We all realize that. But the main transmission lines, the main pumping stations, the treatment plants have to be aided by both the State and the Federal Government.

Now, it was mentioned to you earlier today that the County Commission today--and this was not by coincidence, this is something we have been working on for several months--approved a resolution authorizing the issuance of $40 million of revenue bonds, $32.5 million of which or better than 80 percent is for water and sewer facilities. Now, there has been a lot of misinformation about this bond issue in the press and I would like to correct it for the record right now. Certain members of the press have been stating that $25 million of it is to acquire one private utility in Dade County, and I am sure that if Mr. Reynolds, who has been before you today, believed what he read in the papers he would be down with the certificate of sale immediately. $25 million has been the price tag that has been placed upon the acquisition of all 31 private utilities in Dade County, not just General Waterworks.

So what will this $32 million be used for? As I said, General Waterworks is under condemnation by Dade County and we are going to set aside some $10 million for the acquisition of this utility. This is not to say that it is worth $10 million. We have offered them $7.75 million in an out-of-court settlement, telling them that we thought it was too much but we felt as an out-of-court settlement it was fair to save the cost of litigation. The remaining $22.5 million will be spent for expanding utilities, improving them, and building new facilities.

I also want to point out that just as soon as General Waterworks has been acquired, one of the first things we intend to do is to take this utility's financial statements, which will be debt free, since they have been paid for fully out of this bond issue, and issue a revenue bond. We have estimated that we will issue a revenue bond somewhere in excess of $10 million.

So in that way you have replaced the money you have put up for the acquisition of this utility, but you cannot go to court and say we are going to condemn this utility, we are going to pay it through revenue bonds to this utility, who doesn't want to sell. You can't do that. You have to put up the money first and then sell the revenue bonds on the market.

Just to give you a little idea of some of the new work that will be going on in Dade County, we anticipate to get under way this year alone, within the next twelve months, about $7 million of water and sewer facilities, but primarily sewer facilities. The Myrtle Grove line is a $1,700,000 project with $729,000 coming from HUD. The balance of about $950,000 will be paid out of the proceeds of the bond issue.

The West Dade sewer system, that I have pointed out to you on the map, the extension of it beyond the Palmetto Expressway, out Flagler Street westward, the extension is about $1,800,000.

The Perrine-Goulds water treatment plant and force main will cost approximately $1,300,000 and with the half million that has been promised by HUD we will put up the other $800,000 to get it built.

To provide primary treatment of the North Dade sewage treatment plant that I have previously indicated, this is going to cost about $850,000 with $350,000 promised by FWQA, leaving about a half million to be paid locally.

To upgrade the Sunny Isles sewage treatment plant to primary treatment, this will cost about $900,000 and we have an application in to FWQA for $340,000, leaving $560,000 to be funded locally.

Within the city of Hialeah we have an L-shaped unincorporated island which is not sewered at this point and it certainly doesn't make sense for the city of Hialeah to spend $9.5 million to sewer the entire west half of the city and leave this unincorporated island on septic tanks. We will have the equivalent to a cesspool and a sterile community. So we propose to put up $450,000 to build a sewage collection system in this unincorporated island within Hialeah to be paid back over a 10-year period through special assessments on a front foot basis.

There are other miscellaneous projects totaling about a quarter of a million dollars and then also in the West Dade area we will be building a water treatment plant and an extension of the sewer transmission line--I mean the water transmission lines in the West Dade area. This will be about another $1,800,000.

This is $7 million that I have just outlined to you right now to which we are committed this year.

Furthermore, we have an application in with FWQA for the construction of another ocean outfall in the North Dade area known as the Northeast Dade outfall or otherwise known as the North Miami Beach outfall. This 60-inch force main treatment plant and outfall will provide for sewage disposal primarily from the city of North Miami Beach, which is about 40,000 inhabitants, and the entire North Dade area, that is the area north of that being served by the North Miami outfall. This we hope will be the last outfall that we will be building in Dade County, and we concur in the report that was presented yesterday by Mr. John Hagan that the immediate solution to our problem is to orientate your sewage collection systems towards ocean outfalls. But that doesn't mean that we are going to do that forever. There has got to become a parting of the way.

We have also got to consider the conservation of water for this area and, therefore, it is our plan, taking a hypothetical line, probably 117th Avenue, that everything west of 117th Avenue will go to a central regional tertiary treatment plant and will be discharged either into the ground, into the underground water supply, or westward to the water conservation area.

The North Miami Beach ocean outfall which I outlined to you is going to cost about $8.5 million, of which $2.7 million has been allocated under the PL-660 program this year. It is one of the highest priority items in the FWQA budget for the State of Florida.

You have also had people appear before you complaining about the inadequacy of water supply on the island of Key Biscayne. This area is a service area of General Waterworks, which is under condemnation, and just as soon as that utility has been acquired and it becomes the county's responsibility, we intend to run another source of water or another transmission line from the mainland to Key Biscayne. This will cost about $1,200,000.

The extension of the West Dade sewer interceptor on page 3, which is going to be from 107th Avenue to 117th Avenue and Flagler and then southward to Bird Road, will cost about another $1,800,000, which we hope to obtain within the next 12 months.

Also with the completion of the Perrine-Goulds sewage treatment plant and water treatment plant by February of 1971, which is only three months away, we want to immediately start on the expansion of that plant for 2 million gallons a day to 4 million gallons a day. This will cost about another $2 million.

This, gentlemen, basically outlines the immediate plans for what we will be doing with this $40 million. And as you can see, it doesn't go very far. We are going to need all the support we can get from the Federal Government and from the State in accomplishing this.

There have been quite a few statements today about septic tanks in Dade County and what needs to be done, sewage treatment plants and what needs to be done, and I only feel it is fair for me to read into the record a report from the County Manager to the County Commission, I am only going to read a part of it, dated June 2, 1970, on the effect of the new pollution control ordinance which was passed and adopted by the County Commission on June 2, 1970. On the matter of septic tanks this new ordinance provides that:

> Where public water is available, no facilities are to be constructed with the use of septic tanks when more than 1,500 gallons per day per unsubmerged acre of private land will be generated by the projected use of the facility to be constructed. Where no public water is available, the construction density will be cut in half, that is to 750 gallons per day per unsubmerged acre of private land.

What we are doing is we are not saying that there will be no more construction in Dade County with septic tanks. We are limiting the density of construction in Dade County on septic tanks.

Furthermore, on the matter of sewage treatment plants:

> The requirement that utility sewage treatment plants discharging into inland or near coastal waters will only be permitted upon the highest

and practical level of sewage treatment, that is "tertiary treatment", which was previously set at January 1, 1972, which was previously proposed but as passed in the ordinance was changed to January 1, 1973.

So by January 1, 1973, according to this ordinance, all sewage treatment plants discharging into inland waters or nearby coastal waterways will be required to be a tertiary treatment.

On the matter of ocean outfalls, the requirement was that all ocean outfalls had to be at the level of primary treatment by January 1, 1972. Now, while this ordinance was being drafted the State Legislature met and passed a State law that said that by January 1, 1973, all these ocean outfalls would have to be at secondary treatment. That is why you will find that, as I have outlined to you previously, we are presently upgrading our plants to meet primary treatment by January 1, 1972, to meet our county code, which in turn will have to be upgraded within the following year to secondary treatment as required by State law. However, we feel that this can be done in the stages without wasting money in the process and we feel we are getting ahead of the State law by doing it on this basis.

MR. STEIN: I am afraid I missed a point there. Did you say you were going to meet that State requirement to give secondary treatment?

MR. CARTER: I said that we are upgrading our sewage treatment plants to meet the county requirement of primary by January 1, 1972, and then we will have to go to secondary treatment to meet the State deadline of January 1, 1973.

MR. STEIN: And you are going to do that?

MR. CARTER: We always have been lawful.

MR. STEIN: All right.

MR. CARTER: The ordinance also made certain provisions about the requirement of licensing of sewage treatment plant operators and for the testing and licensing of laboratory technicians. The ordinance also requires that "the person or persons polluting the waters of Dade County to be required to restore these waters to the conditions existing before the pollution occurred and bear the cost thereof."

Now, these items which I have outlined to you were presented to Mr. Reed when he was here earlier in March of 1970, which he thought was a great step forward, and I just want to report to you and remind you that these were the conditions, that they have been passed and they are now the laws of Dade County.

I would like to comment briefly on the report that was presented yesterday by Mr. John Hagan, and although we do not agree with all of the factual data that was presented, I am sure they were honest errors because the report certainly appears to be very objective. I do want to state that we basically agree with the conclusions of the report and most of the recommendations. But there are some of the recommendations that we feel we have to point out to this panel.

One is Recommendation No. 3. It is on page 5, Recommendation No. 3.

This states that "Abatement of all wastes being discharged to the inland canal system of Dade County by January 1, 1973." We feel that this deadline of January 1, 1973, of ceasing to discharge all wastes into inland canals just cannot be met. In spite of the programs that I have outlined to you of taking sewage treatment plants which are now discharging into canals off of these canals and into sewage transmission lines, it would be almost impossible, in fact it will be impossible, to have all of these treatment plants out of business and tied into county systems by that date.

We feel that the requirement should be as we have in our code and that is any treatment plant discharging into canals be required to provide tertiary treatment, because to follow this recommendation, Recommendation No. 3, would mean that the sewage treatment plant which we are now constructing in the Perrine-Goulds area, which will provide tertiary treatment prior to discharge into Black Creek Canal, and one-third of which is funded by the FWQA, will have to be abandoned by January 1, 1973. That is the way we read the recommendation. Maybe we are wrong. But that is the way we interpret it.

So what we are saying is--

MR. REED: Did it ever cross your mind you might be able to dispose of the effluent in another way?

MR. CARTER: If that way was shown to us, we would be glad to do it, Mr. Reed.

Secondly, that all existing sewage systems to be discharged to ocean outfalls. Again while we basically agree on this, we feel that all sewage cannot be discharged to ocean outfalls. As I pointed out, it is our intention in our long-range plans that the West Dade area will eventually be discharged westward or through deep well injectors into the ground for sewage disposal.

Recommendation No. 4 provides for approval plans for sewage collection systems for septic tank areas to be prepared by August 1, 1971. Again we are not quite sure what that means. If it means having detailed engineering plans for complete sewage collection systems for 50 percent of Dade County which is on septic tanks by August of next year, it just can't be done. If it means providing a master plan with a schedule for the phasing out of septic tanks in Dade County, this is one thing. We can have that by August of 1971. But I would also like to point out, as I have previously said, that the present code, although it does not eliminate septic tanks per se, is going to make the future construction of septic tanks most difficult because of the density requirements.

Furthermore, in Recommendation No. 4 it also states that, "No permits should be granted for future construction of septic tanks." We feel that the requirement that we have in the code which in effect says that you cannot construct on a septic tank unless you have a density of one house per quarter acre will be sufficient.

Recommendation No. 5 says, "No future additional waste discharges to lower Biscayne Bay and its tributaries, including the Biscayne National Monument. Removal of existing municipal and industrial waste discharges should be considered for the protection of the present high quality of these waters."

Again we say that if you can't discharge into the Black Creek Canal with properly treated sewage, talking about tertiary treatment now, the phosphate removal as we have provided in the Perrine-Goulds area, this was one thing. We agree that the private utilities that had been operating in the South Dade area had not been providing adequate treatment and they will have to meet the county standards of tertiary treatment by January 1, 1972.

But if we are not going to be allowed to discharge into Black Creek Canal--

MR. REED: Why don't you enforce secondary treatment? Don't talk to me about tertiary treatment in 1971, Dennis. Why don't we enforce the law now?

MR. CARTER: Mr. Reed, I am reciting to you the pollution code of Dade County that I was instrumental in drafting and which was adopted by the County Commission after it was reviewed by you and your staff and also about the facilities which Dade County is constructing.

As far as the enforcement of the code, I feel that there has been exaggeration and emotionalism today on the lack of enforcement. I think there has been a great deal of enforcement in Dade County and considering the monumental task that they have had that they have done a commendable job. We did not inherit this sewage problem in the last two or three years. This has been growing for 40 years. But it has only been in the last four to five years that the community has demanded that something be done about this. Five years ago people could care less.

So when Dade County inherited this problem, the matter of pollution enforcement in Dade County, it was already on a crisis basis, and the slides that you have seen, the majority of them that Dr. Fogarty showed you I noticed were a small package treatment plant, Howard Johnsons, Holiday Inns, and so forth. They were not of the large utility plants such as Community Utilities, Peninsula, and so forth, which have upgraded their quality of treatment. So there has been an upgrading of quality of treatment of the major treatment plants in Dade County. The concentration has been where the pollution is the greatest and that is where I feel it should be.

Also there have been statements made that we need a moratorium on construction in Dade County and that there have been no moratoriums on construction in Dade County, and I want to clarify for the record that this is not true. Right now as of today there is a complete hold on all construction on Key Biscayne for both water and sewers. There has been a hold for almost two years now of all construction in the service area of Community Utilities,and that hold will continue until Community Utilities is tied into the West Dade sewer interceptor,which is now under construction and which will be completed by August of 1971.

There are nine other utilities on which there is a partial hold, a hold to this extent, that there is a moratorium on the extension of sewer lines of these utilities even within their service areas. In other words, if the utility has its sewer line in the street and you are building abutting the line--and I am talking about residential homes now, duplexes, not apartment buildings, large apartment buildings--then your construction is allowed, but we are not allowing these nine utilities I am going to name to extend their sewer lines either outside the service area or even within the service area. And these are: Westwood Lakes in the West Dade area; Florida Water and Utilities in the South Dade area; Snapper Creek, which is also known as Peninsula Utilities, owned by General Waterworks; Golden Isle Utility to the north; Myrtle Grove, owned by the city of North Miami Beach; Carol City sewage treatment plant, which is a neighbor of Myrtle Grove; South Miami Heights sewage treatment plant; Palm Springs North; Bel-Aire, also known as the South Dade Utilities, in the South Dade area; and Southern Gulf Riverdale plant in the North Dade area.

Furthermore, three of these plants--Community Utilities, South Miami Heights, and Golden Isle--are presently under court injunction to comply with the pollution code of Dade County.

So something is being done, gentlemen. As I said before, this problem--and I am not defending anybody, I am just stating facts--this problem did not happen in three or four years. It has been happening over the last 40 years. We are pushing hard against the tide to achieve it.

We have a good ordinance. We have, as Mr. Patton said, one of the toughest ordinances in the State of Florida. We have a new County Manager; we have a new Pollution Control Officer; and I am most hopeful that we will see even more progress in years to come.

Thank you.

MR. STEIN: Thank you, Mr. Carter.

Before I throw this open for questions, I think your statement speaks for itself and it is a very clear one. I hope for your sake you have less differences with General Waterworks than you are going to have with this panel. I will say this for the panel and I will ask them to do this, I think it is clear that we are going to have to have long and extended discussions with Mr. Carter and other representatives of the city to get a meeting of the minds. The only thing I can say to you now is this is not unusual as a first blush from what we have heard from other cities in similar situations. I think it will work out, but I am asking you, please, keep your

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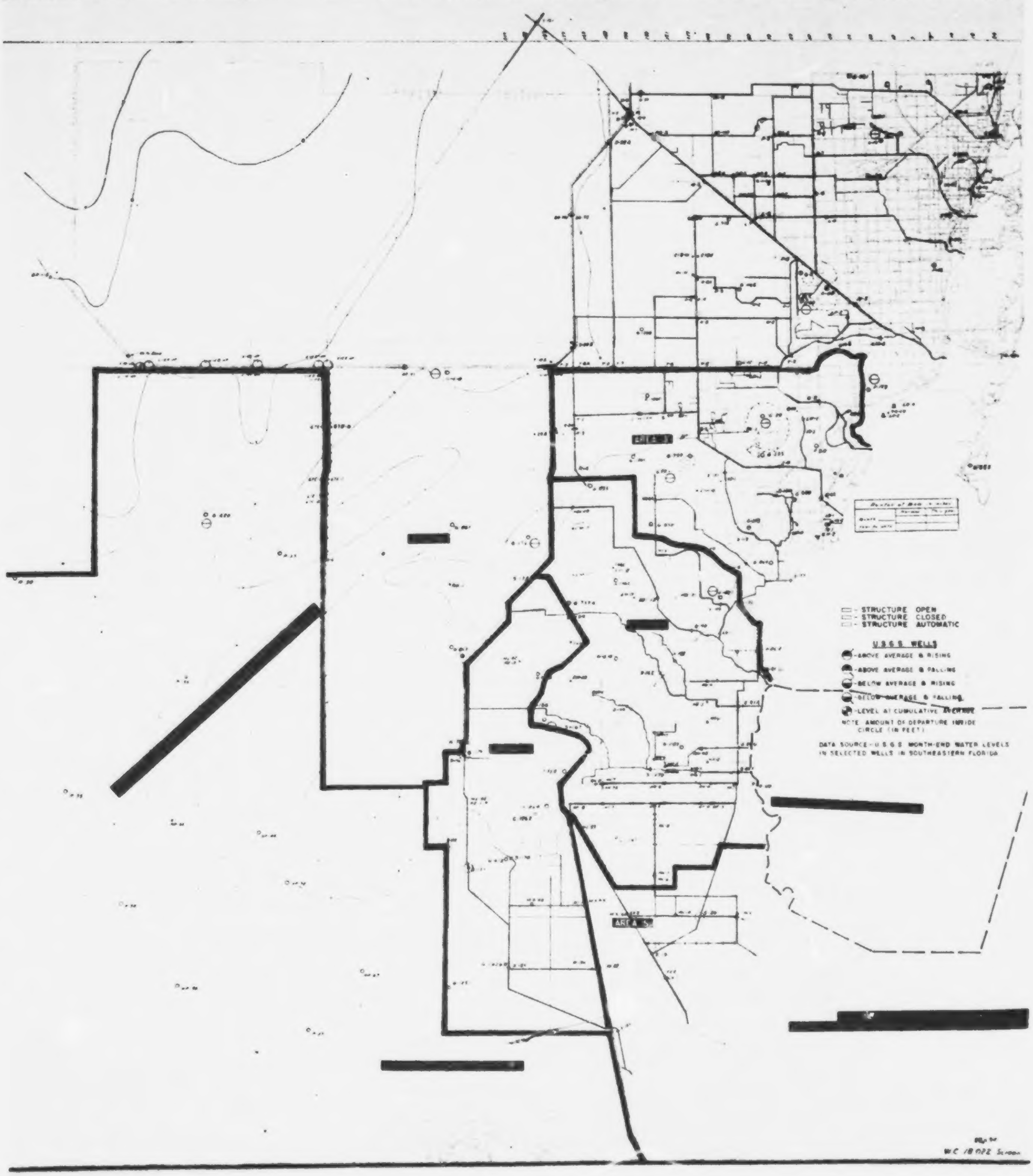
AREA 3
AREA 5
▭ - STRUCTURE OPEN
▭ - STRUCTURE CLOSED
▭ - STRUCTURE AUTOMATIC
U.S.G.S. WELLS
◒ - ABOVE AVERAGE & RISING
◓ - ABOVE AVERAGE & FALLING
◒ - BELOW AVERAGE & RISING
◓ - BELOW AVERAGE & FALLING
◐ - LEVEL AT CUMULATIVE AVERAGE
NOTE: AMOUNT OF DEPARTURE INSIDE CIRCLE (IN FEET)
WC 18 022 Screen

DATA SOURCE - U.S.G.S. MONTH-END WATER LEVELS IN SELECTED WELLS IN SOUTHEASTERN FLORIDA

[redacted]

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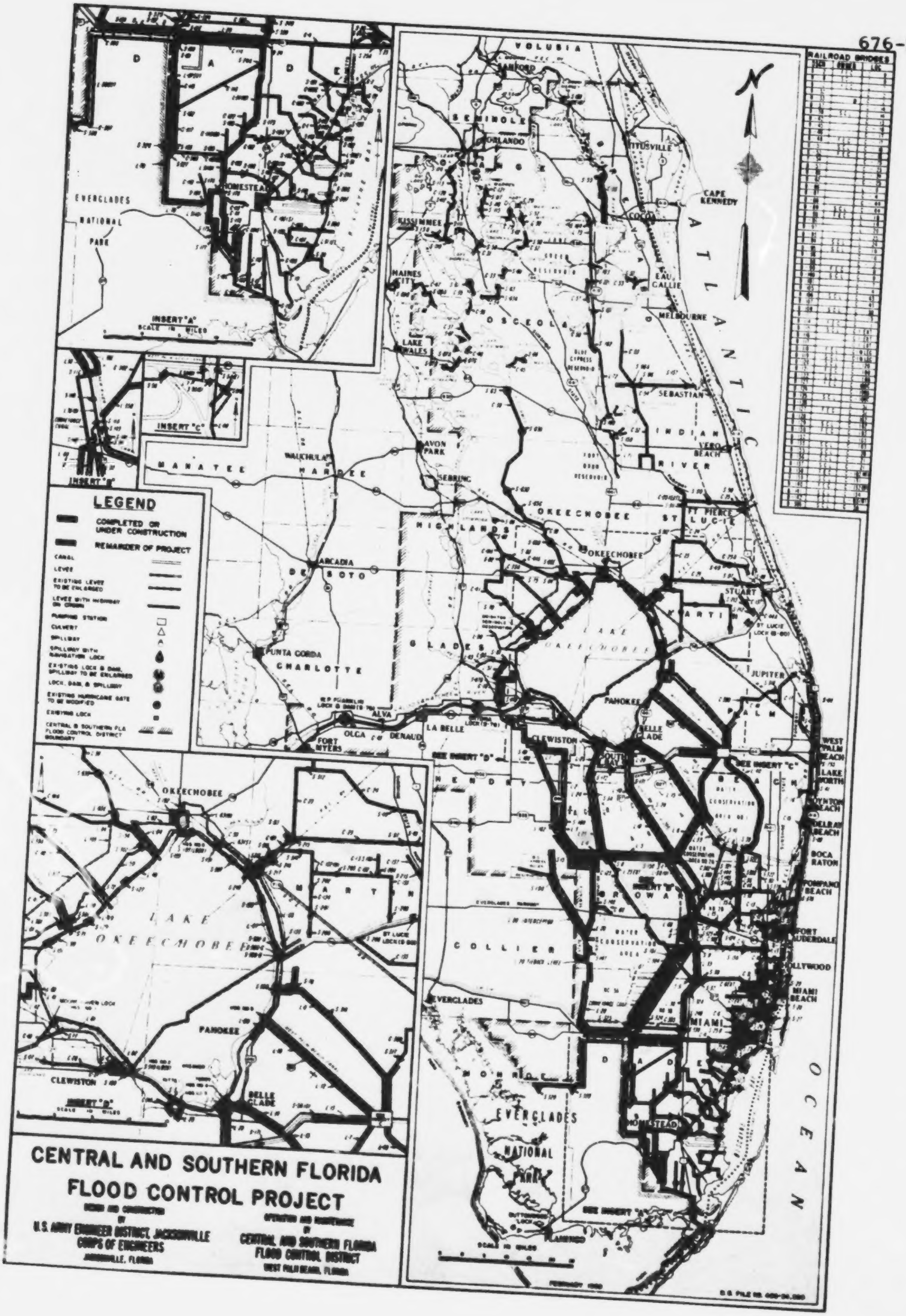
676-B


RAILROAD BRIDGES
LEGEND
COMPLETED OR UNDER CONSTRUCTION
REMAINDER OF PROJECT
CANAL
LEVEE
EXISTING LEVEE TO BE ENLARGED
LEVEE WITH HIGHWAY ON CROWN
PUMPING STATION
CULVERT
SPILLWAY
SPILLWAY WITH NAVIGATION LOCK
EXISTING LOCK & DAM, SPILLWAY TO BE ENLARGED
LOCK, DAM, & SPILLWAY
EXISTING HURRICANE GATE TO BE MODIFIED
EXISTING LOCK
CENTRAL & SOUTHERN FLA FLOOD CONTROL DISTRICT BOUNDARY
INSERT "A"
SCALE IN MILES
INSERT "B"
INSERT "C"
INSERT "D"
EVERGLADES NATIONAL PARK
HOMESTEAD
VOLUSIA
SANFORD
SEMINOLE
ORLANDO
TITUSVILLE
CAPE KENNEDY
COCOA
EAU GALLIE
MELBOURNE
KISSIMMEE
HAINES CITY
OSCEOLA
LAKE WALES
SEBASTIAN
INDIAN RIVER
VERO BEACH
AVON PARK
WAUCHULA
MANATEE
HARDEE
SEBRING
HIGHLANDS
OKEECHOBEE
FT PIERCE
ST LUCIE
ARCADIA
DE SOTO
STUART
MARTIN
LAKE OKEECHOBEE
GLADES
PUNTA CORDA
CHARLOTTE
JUPITER
PAHOKEE
PALM
BELLE GLADE
ALVA
OLGA
DENAUD
LA BELLE
FORT MYERS
CLEWISTON
HENDRY
SOUTH BAY
WEST PALM BEACH
LAKE WORTH
BEACH
BOYNTON BEACH
DELRAY BEACH
BOCA RATON
POMPANO BEACH
FORT LAUDERDALE
BROWARD
COLLIER
HOLLYWOOD
MIAMI BEACH
MIAMI
EVERGLADES
DADE
MONROE
EVERGLADES NATIONAL PARK
FLAMINGO
ATLANTIC OCEAN
N
SEE INSERT "A"
SEE INSERT "B"
SEE INSERT "C"
SEE INSERT "D"

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT

DESIGN AND CONSTRUCTION
BY
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

OPERATION AND MAINTENANCE
BY
CENTRAL AND SOUTHERN FLORIDA
FLOOD CONTROL DISTRICT
WEST PALM BEACH, FLORIDA

comments brief because we are not going--or questions--we are not going to solve these questions, all the problems that we have over a little difference.

There is just one thing I would like to point out to the audience. The reason we weren't down here in the last four or five years until now, until Governor Kirk asked us, is because of the way the Federal law reads and still reads. You can't go into one area unless pollution in one State endangers health or welfare of persons in another area without a Governor's consent. We did manage to get to most of the major cities because they happen to be in these interstate areas. Just because of the fortuitousness of geography we haven't been able to get here until Governor Kirk extended us that invitation. But, brother, we are here now. (Laughter.)

Mr. Thoman?

MR. THOMAN: Mr. Carter.

MR. CARTER: Yes, sir.

MR. THOMAN: There are several things that I want to comment about.

Number one is that I don't know what funds Mr. Lorentzon has under his control that he could promise you that there would be a Federal grant, but you were advised on Monday morning by Mr. John Wakefield and Mr. E. T. Hyman from my office that there were no 3C planning grant funds available at this particular time, even should your application be approved.

In addition to that, the law is rather specific as to what a 3C grant is, for and nowhere do I read into it that it is for the development of a master water and sewer plan for a city. It is for the development of an effective comprehensive water quality control and abatement plan for a basin.

As I also remember because of the immediacy of this thing, Mr. Wakefield and I believe Mr. Hyman, during the past 12 to 15 months, have had numerous conversations with people in the Dade Metro County government--I don't know whether they were with you--on the development of this. I have been beating them over the head trying to find out where the application is, and in all that time it has not been forthcoming.

Secondly, if you knew of this conference, as I indicated in my opening statement, this is a conference between the State of Florida and the Federal Government. The law again is extremely specific on that. The State of Florida may invite whomever it wishes to come and present statements, and if they don't choose to invite someone they don't have to. However, we have made available our report, which did not become available until a week ago, to anyone on an enterprise basis that requested it. And I don't know that you have asked for any or anyone in the metropolitan Dade government.

Now, it seems by the whole tenor of your statement that all that is being accomplished by the elimination of this 15 million gallons a day of sewage that is going out through a group of sewage treatment plants, maybe 20, is taking little pollution and making big pollution off of North Miami.

You also alluded to the fact--you stated the fact that the Federal Government and the Federal Water Pollution Control Administration had approved that outfall. That outfall was constructed under funds supplied by the Department of Housing and Urban Development. In the case of a HUD grant, FWPCA and its successor agency of FWQA are permitted to certify or can certify that grant for approval if it does not violate water quality standards. This had nothing to do with the degree of treatment. At the time that that grant was approved--and I was not in Atlanta at the time, I was in Athens in the process of moving back--my construction grants director, almost over his dead body, was instructed by the Commissioner of the Federal Water Pollution Control Administration to approve the grant because no water quality standards were in existence at that particular time. And I certainly don't believe that you should infer that we approved, because we didn't. We certified it as being adequate under the existing law at that time.

The next thing is that you have alluded at several points that there was FWQA money in a lot of projects around here, including the Goulds-Perrine. If you will remember very clearly at the time of the Florida Power and Light Company conference, the Biscayne Bay conference, you and Mr. Homer and I and other people met, and I was faced with one of the most difficult decisions in my life when I agreed to go ahead and approve a Federal Water Quality Administration grant for that Perrine-Glouds plant in the proliferation of just small treatment plants. I informed you at that time verbally that there would be no extension of that plant. I also informed you that it was a temporary plant; it was not to be considered as a permanent plant until such time as you had developed an integrated plan for Dade County. And I want to make sure that the record is very, very clear on that.

The next thing, at that same meeting, I was faced again with two HUD grants for the construction of a sewer, eliminating two small sewage plants in North Dade County over on the beach some place, I don't know where they were, and I told you that I would not certify that as adequate to HUD unless you agreed to put in primary treatment, which was the thing. I understand we proceeded on good faith and certified it to HUD and that you would proceed with primary treatment, and I don't know whether the application is in for that or not. I hope it is.

MR. CARTER: It is.

MR. THOMAN: What I am getting down to here is that up to now I have found myself in the very unenviable position of being faced with having to approve something to prevent the discharge of raw sewage. I can assure you that with a credibility gap of that type that there is going to be, in my official capacity as Regional Director of FWQA and not as conferee here, there is going to be a very, very, very close examination of any future projects coming out of Dade County, and there probably will be, and there is going to have to be, a binding agreement before any monies are paid.

MR. STEIN: Before you go on, you know, I have all night, I am ready to stay here and listen to this, but I again suggest that we make our remarks brief. And I am going to give Mr. Carter a chance to reply for the record.

I should say in addition to that, Mr. Thoman, that maybe you and the conferees don't know it, but with this enforcement case they have a nasty little rule and before any more grants are approved I am going to have to sign them. (Laughter.)

Mr. Carter.

MR. CARTER: Gentlemen, the point I was bringing out is, and as Mr. Thoman has stated, at the time that the North Dade transmission line was extended, and with Federal funds, that there were, as Mr. Thoman stated, no Federal water quality standards at that time. I was bringing out that in the short period of just the last four years we have gone from no treatment to pretreatment to primary treatment and now to secondary treatment as far as ocean outfalls and to tertiary treatment as far as treatment plants discharging to inland waters. I am just pointing out that we have been accused of providing if you want to call it cheap, inefficient treatment facilities, but at the time that these facilities were designed and financed and approved, that was the accepted level of treatment at that time in these particular areas. They have since changed and we recognize this.

But I am also pointing out that we are working very hard with Mr. Reed's office and with Mr. Thoman's office to meet all Federal quality standards as far as water and also with Mr. Reed's office likewise. And we are going from pretreatment to primary to secondary as far as ocean outfalls. We are complying, but it takes time to design these facilities, and it takes money to build these facilities, and it takes more time to construct these facilities. This we are doing.

I am pointing out that in the North Dade area that we have a treatment facility that upon the day that it is opened on December 1, which is only six weeks away, it is inadequate. We already have an application in to go to primary treatment, which has been approved, and when that is completed it will be inadequate as far as January 1, 1973, standards and we have to upgrade it again.

I am pointing out that we are meeting the standards that have been required at the time that these facilities were planned and funds were applied for and the financing was completed. But we are working with the change in technology and the standards which have been established by both the county, the State and the Federal Government, and these have been very drastic, and they have been very swift, and we are caught up in this situation. We are working cooperatively and will continue to work cooperatively with both governments in this respect.

MR. STEIN: Mr. Reed.

MR. REED: I want to point out, Dennis, that the laws on ocean outfalls requiring treatment were passed in March of 1968, and I haven't seen any evidence that North Miami Beach has read that law because they certainly haven't begun.

I am going to cut my statements way down.

Dennis, when you say a State grant program--you have been in government long enough--where does the State grant program come from?

MR. CARTER: You are talking about this note, 25 percent to be put up by the State?

MR. REED: Where would a State grant program come from?

MR. CARTER: It would be paid for by the people in the State of Florida.

MR. REED: Who would vote for it? Who would be the ones who would initiate it?

MR. CARTER: The people of the State of Florida.

MR. REED: Through whom?

MR. CARTER: Through their public referendum.

MR. REED: Their legislators, their duly elected legislators. How many legislators come from Dade County?

MR. CARTER: I believe there are 22 plus the Senate.

MR. REED: How much percentage of that of the whole Legislature is there?

MR. CARTER: About 20 percent.

MR. REED: I suggest the County Manager's Office call a meeting of the Dade delegation. That is where it has got to come from.

Now, we heard, I think I understand it, where at the rate of $7 million over the last four years of local money has gone into the program.

MR. CARTER: In the last four years.

MR. REED: Have I got that right?

MR. CARTER: Yes.

MR. REED: $7 million of Federal money.

MR. CARTER: Right.

MR. REED: At my calculation we will be about 143 years catching up with no growth and no increase in inflation at that rate. I can't believe the county is serious at $7 million for four years.

MR. CARTER: Mr. Reed, as I have stated, this was a start. When the master plan was completed in 1961 it came out with such a high price tag that everybody just threw up their hands and said,"where"--and this was in 1960 level of dollars now; we were talking about $400 million in 1961. This was such a preposterous figure that everybody said,"Where do you get this kind of money," so nobody did anything. It was Mr. Porter Homer's decision when he came in as County Manager that you have got to start. As Confucius said, "A long journey is taken with the first step," so quit talking about it and start doing something.

We have done something. We have attacked the most critical areas, $32.5 million worth. It is short, I agree with you. And believe me, my work would be much easier if the money was available.

MR. REED: I have never known such a fantastic ability to use Federal money before. Some of the other counties would be jealous as hell if they could just figure out how to get all that HUD money. That has got to be the greatest sleight of hand I have ever seen.

I have to hear one more thing clearly. You said something that the county was high on the PL-660 list for an ocean outfall. For a new ocean outfall?

MR. CARTER: Yes, sir.

MR. REED: Well, you had better read the 660 list, because that is not so.

MR. CARTER: It is the ocean outfall regardless of whether Dade County builds it or the city of North Miami Beach builds it.

MR. REED: It can't be on the 660 program, Dennis.

MR. CARTER: It is.

MR. REED: Well, I guarantee you won't be there very long because an ocean outfall is not treatment. I would have a heck of a time with the Federal Government on it.

MR. CARTER: With secondary treatment it meets the standards, Mr. Reed.

MR. REED: Well, that will be interesting. I am shaken. I have heard this four times, however.

And Dennis, I think you are a wonderful fellow, but you have got an unenviable task in life and that is defend the situation here in Dade County.

MR. STEIN: Let me ask this question. This is really for clarification.

MR. CARTER: Yes, sir.

MR. STEIN: Because I think, at least to my mind, we have to be clear.

You talked in terms of eliminating several septic tanks, getting several more million gallons of wastes by sewer service, is that correct, in one of those areas there?

MR. CARTER: Well, as I said, the problem of attack is at septic tanks and at sewage treatment plants combined.

MR. STEIN: I understand that. But you are taking the septic tanks and, as I understood you, you are saying you are going to provide pretreatment, which is flotation, and that is going to happen pretty soon. It is going to go into effect. Now, what I am getting at, are we to expect that as you alleviate these septic tanks we are going to find a lot worse conditions in our waters if all you are going to do is provide flotation before you put it out? And it is incredible to me that anyone in the last 15 years has thought about flotation as a method of treatment.

MR. THOMAN: Dennis, that was the gist of the recommendation on septic tanks--that as your plan was developed, the interceptor sewers and the treatment plants, etc., were in, that the development of the collection system proceeded as the completion of those facilities came along. It was not like Goulds-Perrine where the collection system was done and we had to get the treatment plant.

MR. STEIN: Pardon me, this is the point. This is what I don't understand. As I listened to your program that you have outlined here, these people out there can expect worse waters as you get these sewers connected. Isn't this what you said? Because you are not even going to provide primary treatment for a lot of these waters; just flotation. There is one thing about septic tanks, for awhile they generally don't contribute to pollution of surface waters. But if you put them in a sewer, get these millions of gallons in your sewer system and are not going to provide treatment, this situation is going to get worse before it gets better.

MR. CARTER: Mr. Stein, what I was saying was that the projects that we have undertaken which were initiated some four years ago at the time that they were undertaken and financed and the necessary approvals were obtained, these were the standards which were in effect then--standards in effect or lack of standards that we had.

MR. STEIN: I understand.

MR. CARTER: I am trying to point out that we inherited the situation when we came into the picture where the city of North Miami had an ocean outfall that only provided pretreatment. Nobody said there was anything wrong with that. We went in to expand this facility to provide for sewage disposal from Hialeah. We are now completing this facility.

And I pointed out that in the last four years your standards have changed, and I am not quarreling with that. I am just saying that we are fighting against a situation where standards are changing; they are being upgraded, and we are working diligently to meet these changes in standards. We will have a treatment plant that will only provide pretreatment as of the date it opens, but we are already almost complete with a design to go to primary treatment, and we have an application in to the Federal Government to go to primary treatment on this particular plant. And no sooner will that be completed, we will have to go to secondary treatment to meet the State's standards in 1973.

MR. STEIN: I understand what you are saying, but I wonder if the people understand what you are saying. As soon as you complete those Hialeah sewers, the waters are going to be worse as soon as you throw the valve, because you are not going to provide treatment. You are going to gather all that stuff up and dump it out without any treatment. Unless we inform the people that the situation is going to get worse, we are going to be in for an awful shock, especially if they think we are going to clean up pollution and the thing is going to get better. I think we have to be absolutely candid with the public and tell them we are going to have several more million gallons gathered into your greater Miami sewers that are going to be poured into your waters without treatment.

MR. CARTER: Into the ocean.

MR. STEIN: Into the ocean. Aren't these your waters?

MR. CARTER: Mr. Stein, let me say again--

MR. STEIN: That is the part I use mostly when I come down here.

MR. CARTER: It was the consensus of the health officials of those involved at the time these facilities were planned--and this is only going back three years--that this was a major step forward, and it was better to have pretreated sewage discharging into the ocean 10,000 feet out in the Gulf Stream than to have 8 million gallons of raw sewage a day discharging through septic tanks in the Hialeah area, which is immediately above the water reservoir from which the city of Miami gets its water and from which 70 percent of Dade County receives its water. This was considered a major step forward.

Since then we have ourselves independently and voluntarily imposed the requirement of primary treatment. At the same time that we accomplished this the State passed a law that said that by 1973 you will go to secondary and we are taking these two steps.

MR. STEIN: By the way, I am not arguing. I think Virginia Rankin there, who, though, is independent, will agree we have heard this before. We have worked on cases for over 25 years.

We had the same thing in St. Louis County when they put the pipes in and gathered up all the material that was going into the ditches, running in the little streams, running through the county on the notion that you had to keep them out of the ditches because the children would go in there and play. But when they gathered that up and moved it down to the Mississippi and Missouri Rivers without any treatment, you surely weren't improving those rivers.

You have to live with this as a resort area as well as I do. By the way, I hope you reconsider that quarter acre septic tank deal, because I come from a county that has gone through the throes of that. What would you think if you were living up in Fairfax County and making a choice whether to go to the Virgin Islands, Puerto Rico or some other place or take the family car and go down to Miami and you heard that they were gathering up a couple of million gallons of sewage from the Hialeah area and dumping it into the ocean without treatment? Do you think that would set very nice?

MR. CARTER: Mr. Stein, as I have stated over and over again, I don't want to be repetitious, but we are meeting the State requirements; we are meeting the Federal requirements; and our own requirements, which were voluntary, call for a quicker timetable than even the State. In other words, the State says you have got to do something by 1973; ours say you have to do it by 1972 and we are doing it.

But let me also point this out. Getting away from ocean outfalls for a second, the first sewage treatment plant that Dade County is building, has built, is the one that is going up now in the Perrine-Goulds area. It is a complete tertiary sewage treatment plant complete with phosphate removal. It is the largest municipal treatment plant in the entire State of Florida that has tertiary treatment and phosphate removal. We stand ahead of any other county in the State of Florida in this respect, and as far as we are concerned it is a model for the rest of the State of Florida.

MR. STEIN: Are there any other comments?

If not, thank you very much.

MR. CARTER: Thank you, sir. (Applause.)

MR. STEIN: Mr. Reed, do you have any more?

MR. REED: Yes, I do, Mr. Stein.

I want the record to indicate that as a conferee here we would like to apologize, as the Chairman of the Department of Air and Water Pollution Control, to any of those from the county or from the cities in Dade County that did not receive an invitation to attend this hearing. The Chairman frankly did not know it was his responsibility or the Departmer responsibility to invite them. He knows now.

I would like the record also to show that the Chair would have recognized anybody had they wished to have spoken. I just want that clearly in the record.

And then I would like to say, Mr. Stein, that I have been looking at my logbook on Dade County with some care last night. I have an apology to make to some of my staff who recommended to me as long ago as 2-1/2 years that there was an emergency problem here in Dade County,~~and~~ I thought they were biased,and I thought the local program was going to generate a tremendous amount of local support and governmental support. My regret, sir, is that I did not request the Governor to call you and the Federal Government into Dade County the first day I assumed my title as Chairman of the Department.

MR. STEIN: Thank you, Mr. Reed.

I would like to say one thing--that we do have that Federal law where we just invite the State and they have to invite everyone else. Sometimes this has caused a few problems. We have asked--and Mr. Reed, I know you will be interested in this--we have asked that the law be changed. The Administration in its new bill has requested that we be given the authority to invite the people, because sometimes these slips do occur.

I would like to also say something in light of what Mr. Reed has said. I didn't think this situation was quite what it is, myself, even getting the reports back in Washington. Coming down here and sitting through this and finding where we are, I think we are faced with a major metropolitan area that I can safely say--I don't know if anyone can say they are meeting the requirements, maybe after the conferees make their announcement tomorrow the people will see if they are meeting the requirements or not--we have a crisis area in this.

I seem to go from crisis to crisis. Maybe that is the way water pollution gets done. I remember the times we were on Lake Erie; we were up in Detroit; Chicago; Calumet; Indiana Harbor area. I just got through and am still working on a whole 100 of mercury cases--abating mercury pollution. But as far as I can see, we have programs under way to solve these.

I don't see yet--and maybe at the Executive Session I will be convinced--that we really have a program that is going to see this thing through and give you clean water down here where everyone is committed, and by a program I mean specifics on what we are going to do and when we are going to do it and commitments to do it.

If after discussions with the conferees it develops that we don't have a program, I want to tell you here and now that as far as I am concerned the greater Miami area has grabbed the pollution brass ring. You are the top area as far as the resources that I have at my command are concerned, and they are not inconsiderable, I don't think. We are going to have scientists; we are going to have investigators; we are going to have samplers; and, as some of my legal friends in the audience know, I guess we can match anyone lawyer for lawyer anywhere, at least in numbers, down here doing this.

I am not satisfied that we have all the facts and I am not sure we have every source identified with particularity. But again I want to tell you, Mr. Reed, in cooperation with you and I hope with the county and with the city and the other groups, we are going to get this. If we don't have the facts given to us that can stand up and be certified and that all parties can agree to, we are going to go out and get them.

Let me give you my philosophy about the facts of pollution control. We are dealing with physical conditions that can be measured and ascertained, and there is no reason for anyone, whatever his philosophic differences may be, to differ on the facts of pollution, i.e., what stuff is coming out where and where it is causing damages. If we continue to have this kind of hassle and disagreement, we are just going to put men and resources in here until the situation is laid out so clear and so plain that no one is going to be able to differ with this and be able to get up really and make a statement that will stand up. I say this not in the sense of prosecution; I say this in the sense that we want to help.

And let me again try to give this to you. I think we have a real tremendous problem. This problem cannot be solved unless we forget any kind of conceptualism we may have had, and I think the Federal and State people have gotten this. You can't rest on State's rights, county rights, city rights. The waters aren't going to know that difference. I think this is so big and so complex and we are faced with a situation that for one reason or another is here that we are going to need good will on the part of all hands if we are going to meet this problem. This is going to mean a gathering of the facts. It is probably going to mean the changing of attitudes on all our parts in some measure. It is going to mean whatever philosophic or emotional differences we might have to at least come to an agreement on a program that is going to clean up these waters.

But as far as I see it--and I think I possibly am speaking for the State on this--pollution control officers or environmental people like us are charged by law and we have taken an oath to see certainly that an environment is clean and in this particular place the waters are clean.

I can see no greater challenge for the environmental officers of Florida and of the United States Government of today than to get with it—with this greater Miami water pollution control problem.

With that we will stand recessed now. The conferees will have an Executive Session and we will have an announcement at about 11 o'clock tomorrow when we will reconvene in this room.

We stand recessed.

(Whereupon, at 6 o'clock the conference was recessed until 11 o'clock, Thursday, October 22, 1970.)

- - -

MORNING SESSION

Thursday, October 22, 1970

(11 o'clock)

MR. STEIN: Let's reconvene.

And let me give you the procedure here. I will read the conclusions and recommendations of the conferees and I will give the conferees an opportunity to comment or make any statement or modifications after that. Then we will adjourn the conference.

However, the conferees will remain available for any questions the press or other people wish to ask, but this will be done subsequent to the adjournment of the conference.

The conferees, representing the State of Florida and the Department of the Interior, unanimously agree on the following conclusions and recommendations:

1. Pollution of the navigable waters in and adjacent to Dade County, Florida, including the Atlantic Ocean, Biscayne Bay, and tributaries thereto, which endangers health and welfare of persons is occurring and is subject to abatement under the Federal Water Pollution Control Act. This pollution is caused by discharges from numerous municipal, domestic, and industrial sources within Dade County.

2. Measures taken to abate this pollution have been inadequate.

Conclusions and Recommendations

3. The nature of delays being encountered in pollution abatement are: complexity of the problem, lack of effective planning, financing, and enforcement of pollution control laws; and lack of a commitment by the community to meet the pollution problem and abate it.

4. The Metropolitan Dade County Commission shall present a master plan for abatement of pollution from all sources in Dade County to the conferees, through the State of Florida, by November 1, 1971. This plan is to be in a form acceptable for certification under applicable State and Federal laws and regulations. The plan is to contain sufficient detail so that all significant sources are identified. The plan is to include a time schedule for construction, with interim dates for arrangement of financing, preparation of preliminary plans and specifications, preparation of final plans and specifications, award of contracts and initiation of operation of remedial facilities.

5. The cessation of all waste discharges into the inland canal system of Dade County, Florida, shall be accomplished as rapidly as possible but not later than January 1, 1973.

6. A minimum of secondary treatment, providing at least 90 percent biochemical oxygen demand removal and

year-round chlorination of the effluent, shall be provided for all waste as required by the State of Florida before discharge to the ocean as rapidly as possible but not later than January 1, 1974.

7. All new construction shall be connected to adequate sewage collection and treatment systems. The conferees will meet not later than February 1, 1971, to consider the question of Dade County's building permit program with the view toward controlling additional pollution sources while the Dade County pollution abatement program is under design and construction. It is expected that the Dade County Metropolitan Commission will be prepared to present their action program to the conferees at that time which will satisfactorily meet this problem, including a program for the elimination of septic tanks in all urban areas of Dade County.

8. Additional waste discharges to lower Biscayne Bay, including the Biscayne National Monument, and its tributaries shall be prohibited. This same prohibition shall apply to discharges to canals in Dade County which drain to the Everglades National Park. Removal of existing municipal and industrial waste discharges from these waters shall be accomplished as rapidly as possible but not later than January 1, 1974.

9. All wastes from vessels used as domiciles or

business establishments shall be discharged to onshore facilities. The Corps of Engineers is requested to report to the conferees by February 1, 1971, on its program for removing abandoned hulks, debris, and other obstructions to navigation in the Miami River.

10. An inventory of all municipal and industrial waste sources within Dade County, Florida, shall be initiated immediately by the Federal Water Quality Administration in cooperation with the State of Florida and local officials. A report shall be made to the conferees by April 1, 1971.

11. A technical committee comprised of the Federal Water Quality Administration, the State of Florida, and the Dade County Pollution Officer shall be established to develop, in cooperation with other Federal, State,and local agencies, a regional water quality management plan for the conservation and reuse of the waters of Dade County. This committee shall report to the conferees as to its progress and future plans by November 1, 1971.

This concludes the conclusions and recommendations of the conferees. Are there any comments or modifications by the conferees?

If not, this conference stands adjourned.

(Whereupon, at 11:10 o'clock the conference was adjourned.)

WERNER N. GRUNE
CONSULTING ENGINEER

1219 Manati Avenue
Coral Gables, Florida 33134

November 25, 1970

AIR MAIL

Mr. Murray Stein, Assistant Commissioner
Enforcement Division
Federal Water Quality Administration
U. S. Department of the Interior
Washington, D. C. 20242

RE: Dade County, October 20 - 22, 1970 Conference

Dear Mr. Stein:

As you may recall, at the time of the joint Federal - State Enforcement Conference on Dade County, Florida held in Miami on October 20 - 22, 1970 I had indicated that I would like to make a statement.

During the hearings my name was called on at least one or two occasions but I was not in the room at the time. As I mentioned to you at the end of the conference, I did not know if there would be an opportunity for me to make a statement and due to prior commitments could not be present for the entire two days of conference proceedings.

However, before the end of that week I wrote out my comments and they were transcribed on October 30 to be forwarded to your office for inclusion into the record as you suggested. Due to a change in secretarial help I now find that these comments were never transmitted and I am hurrying this letter to you with the hope that it may still be in time for inclusion into the record.

In closing I would appreciate it if you could send me a copy of your talk "Viewpoints on Enforcement in Water Pollution Control - Federal Government", presented at WPCF meeting on October 5, 1970 in Boston if available. In checking on this matter I discovered that my statement on Dade County had not been transmitted earlier.

Sincerely yours,

Werner N. Grune

Werner N. Grune

WNG/bep

Enclosures

STATEMENT

PREPARED FOR THE

JOINT FEDERAL - STATE ENFORCEMENT CONFERENCE

ON

DADE COUNTY POLLUTION ABATEMENT

held at the

Sheraton Four Ambassadors
Miami, Florida
October 20 - 22, 1970

by

Professor Werner N. Grune, and
Consultant, Van Note - Harvey Associates
Coral Gables, Florida 33134

Mr. Chairman, Conferees and Attendees:

I am a professional sanitary engineer. I have a (a) BS in Engineering, University of Connecticut; (b) MS in Sanitary Engineering, Harvard University; (c) Dr. Engineering Science in Nuclear and Sanitary Engineering, New York University; (d) am a Diplomate of the American Academy of Environmental Engineers; and (e) am a Registered Professional Engineer in the States of New York, Massachusetts and Georgia.

I have been associated with water pollution control since serving with the U.S. Government under P.L. 845 some twenty years ago.

My professional background and qualifications include:

(1) Assistant Professor - New York University (also: Nuclear Waste Disposal Research.) 1948 - 1951

(2) Associate Professor and Professor - Georgia Tech.
    Director of Sanitary Engineering Research
    Research on Nuclear Waste Disposal and Automation of Waste Treatment Plants. 1952 - 1963

(3) Consultant to U.S. Air Force, Corps of Engineers, United States Atomic Energy Commission, United States Public Health Service and various industries.

(4) Currently: University of Miami, School of Engineering and Center of Urban Studies.

(5) Work done specifically cogent to this problem: Recently completed a comprehensive investigation of wastewater renovation and reuse (tertiary and AWT methods), including cost studies for Sarasota County, Florida.

The purpose in presenting this statement is to call your attention to the fact that the condemnation of the widespread use of septic tanks in Dade County (to which I basically subscribe) should be pursued with caution. I am aware of the potential hazards accompanying the discharge of septic tank effluents in a densely settled area. However, there has been a notable lack of discussion of percolation rates, no evidence of local groundwater contamination requiring immediate remedial action, and relatively little discussion of the hydrogeology of the area.

Before recommending the withdrawal of millions of gallons per day of septic tank effluent, which constitute existing artificial recharge to the hydrogeology of the area, it would be advisable to examine and investigate the results obtained under similar circumstances, for example the falling water table problem in Nassau and Suffolk Counties, Long Island, New York. There, too, the existing practice of using the septic tank method for treating household wastes was condemned. After their substitution by a central collection system, followed by conventional waste treatment and discharge to the ocean, problems of falling water table and salt water intrusion raised havoc with groundwater resources. All communities in Nassau and Suffolk Counties derive their water supply from groundwater sources.

Thus, I am simply wishing to call attention to the Long Island experience where the groundwater table has receded (as much as 10 feet in Nassau County) after sewers had been installed, but in the unsewered areas (Suffolk County to the east) the groundwater table did not drop. These experiences have been reported by Baffa & Bartilucci, Greeley & Hauson and others. As supporting evidence I cite a paper by John J. Baffa, Consulting Engineers, New York City:(*)

> Baffa, J. J. and Bartilucci, N. J., "Wastewater Reclamation By Groundwater Recharge on Long Island", Journal, Water Pollution Control Federation, 39, 3, 431 (March 1967).

In the case of Long Island it is clear that the discharge of the collected effluent into the ocean (Sound and North Atlantic) has, in effect, removed from the groundwater reservoir the input which was formerly received from cesspools and septic tanks. Furthermore, there is evidence of gradual salt water encroachment in the newly sewered areas.

I fully agree with the conclusions of the Hollis Report, presented by Dr. James A. Bax, Director, Department of Health and Rehabilitative Services, State of Florida, calling attention to an impending "environmental crisis" and am convinced that the present method of septic tank treatment must ultimately be replaced. Therefore, I wish to make it very clear that I do not differ with the basic policy of doing away with septic tanks and their substitution by a high degree of treatment but the solution of one problem may create a new and bigger one, i.e. withdrawal of groundwater supplies leading to salt water intrusion.

(*) This presentation offers detailed information and actual measurements. (Note: An abstract is attached in support of this statement.)

At this time I am not prepared to state to what extent the total daily discharge of 85 or 100 MG of septic tank effluent (*) contributes to the replenishment of water reservoir or protects against salt water intrusion. Generally there is adequate rainfall and water supply, but there have been two droughts in South Florida in the past two decades. In view of these serious questions which cannot be left to conjecture, I plead for sound engineering investigations and mature judgment.

There appears to be sufficient evidence to show that utter chaos has prevailed in Dade County regarding effective water pollution control measures and that there has been no directed overall or professional planning. It is necessary to end discussion of vagaries. Needed are details such as percolation rates, hazards from pesticides and viruses (such as the studies performed at Stanford University for the U. S. Army Environmental Agency to trace viruses through porous media, and others).

Ultimately, the citizens of Dade County may be served better by shallow or diffusion well recharge of the groundwater reservoir with water of high quality (following tertiary treatment) which is infinitely better than presently existing conditions. The complete reuse concept is expensive but various estimates for pollution abatement in Dade County, varying from $500 million to $1 billion, have been made. In the long run and with proper planning it may cost this much. I feel qualified to speak on this subject as an engineer. We have recently completed a study for Sarasota County, Florida, in which ten methods of tertiary treatment and disposal and five advanced treatment methods, also in various combinations with conventional treatment, were investigated. The cost figures, based on 7½% amortization, vary from $0.16 to $0.64/1,000 gallons, or from $160 to $640/MG treated, for an 8 MGD plant capacity. Tertiary treatment, essential to reduce nutrients to protect the receiving waters through ocean outfalls, will not come cheaply to Dade County.

In summary, I wanted to point out the potential danger of groundwater withdrawal due to the elimination of septic tanks. This must first be investigated versus a drop in the water table and potential salt water intrusion in the local area. This means that the total water budget must be studied.

Looking at the overall problem as part of a master plan, there are some alternatives that should receive equal time and attention before these water resources are sent to the ocean to be lost. They are:

1. Importation of Water Supply.
   The possibility of going some distance into the Everglades for a plentiful source of groundwater supply for the entire County before elimination of all septic tanks should be viewed and studied. In case imported supplies are feasible, the gradual elimination of septic tanks with properly designed and completed ocean outfalls with adequate (tertiary) treatment is possible.

2. Artificial Recharge of Groundwater vs. Salt Water Intrusion.
   Tertiary waste treatment prior to shallow well groundwater recharge may not be necessary if an adequate supply of water for the County can be imported from the northwest.

(*) Based on 200 sq mi, presently under development, this flow represents an average infiltration rate of 0.0288 in/day, equivalent to 10.5 in/year with little or no evaporation loss.

3. Artificial Recharge of Groundwater for Subsequent Reuse.

   Tertiary waste treatment prior to shallow well groundwater recharge would be required to overcome build-up of TDS and nutrients due to repeated reuse.

4. Complete Renovation for Direct Public Reuse.

   The same degree of treatment required as just above, except the lack of underground travel and storage would require disinfection for public health considerations.

5. Deep-well Injection and Ultimate Reuse for Public Supplies or Use vs. Salt Water Intrusion.

   In spite of the "ultimate" (referring to a long time span) reuse concept, tertiary treatment would be indicated, as well as for the ultimate creation of a salt barrier. The Boulder Zone may lend itself to a "freshwater bubble" storage reservoir. The economics of injecting the enormous quantities down 2,500 - 5,000 feet and pumping back up for retrieval may negate this concept, besides other intangibles.

In conclusion, an excellant reference on artificial recharge was published by Signor, D. C., Growitz, D. J., and Kam, Wm. of the U.S. Geological Survey earlier this year. It is entitled :

"Annotated Bibliography on Artificial Recharge of Ground Water, 1955 - 67", Water Supply Paper 1990, U.S. Geological Survey, Washington, D.C. (1970).

I appreciate the opportunity to submit these comments.

Abstract of Baffa, J. J., and Bartilucci, N. J., "Wastewater Reclamation By Groundwater Recharge on Long Island", Journal, Water Pollution Control Federation, 39, 3, 431 (1967)

Wastewater reclamation by artificial recharge has been practiced for over 100 years on Long Island through the leaching of cesspool and septic tank effluents into the soil. The population explosion and influx of industry made it necessary to install sewerage systems to protect the groundwater reservoir against contamination. All towns in Nassau and Suffolk Counties draw their water supplies from the groundwater reservoir. Large collecting sewers have been constructed in the western areas. These systems terminate in treatment plants which discharge their effluents to tidal waters. This discharge, in effect removes from the groundwater reservoir the input formerly received from cesspools and other subsurface disposal systems. In the eastern portions (predominately Suffolk County) there are still large, unsewered areas. In the areas that have been sewered the groundwater table has dropped, while in the areas as yet unsewered the groundwater table has not dropped.

In the extreme western portion of Long Island (Brooklyn and Queens) seawater intrusion has taken place to such an extent that the groundwater under the entire area has become brackish. Near recently sewered areas there is evidence that slow encroachment of salt water is taking place. Freshwater supplies from the groundwater resource still remain abundant in Nassau and Suffolk Counties, however, the water table in nearby sewered areas is falling while the water table is sustained in unsewered areas.

In view of these conditions, the use of wastewater effluents to maintain a high water table offers an economical means of water resource conservation. The availability of treated wastewater effluents for artificial recharge to the groundwater reservoir provides a means of supplementing naturally available water supplies and preventing salt water intrusion into the fresh groundwater supplies. Further renovation of wastewater effluents is necessary for domestic and industrial uses and also is necessary to facilitate injection into the ground.

Hydrogeology

Figure 1 shows the stratigraphy of the water-bearing aquifer under Long Island. The major geologic formations are similar both in Nassau and Suffolk

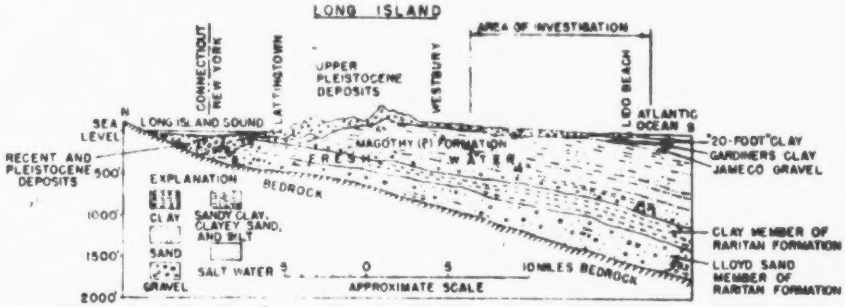

LONG ISLAND
AREA OF INVESTIGATION
CONNECTICUT
NEW YORK
LATTINGTOWN
UPPER PLEISTOCENE DEPOSITS
WESTBURY
LIDO BEACH
N
ATLANTIC OCEAN
S
SEA LEVEL
LONG ISLAND SOUND
MAGOTHY (?) FORMATION
FRESH WATER
20-FOOT CLAY
GARDINERS CLAY
JAMECO GRAVEL
RECENT AND PLEISTOCENE DEPOSITS
500'
EXPLANATION
BEDROCK
1000'
CLAY
SANDY CLAY, CLAYEY SAND, AND SILT
1500'
SAND
SALT WATER
GRAVEL
2000'
5
0
5
10 MILES
APPROXIMATE SCALE
BEDROCK
CLAY MEMBER OF RARITAN FORMATION
LLOYD SAND MEMBER OF RARITAN FORMATION

FIGURE 1.—Generalized section of Long Island showing relationship of fresh and salt water (after U.S.G.S. Water Supply Paper 1613A). (Ft × 0.305 = m.)

Counties. In general, Long Island is composed of unconsolidated deposits of sand, gravel, and clay in more or less parallel beds overlying the hard bedrock surface. The bedrock has a gentle southeasterly dip. The deepest aquifer over the bedrock is the Lloyd sand member of the Raritan formation, composed mainly of medium to coarse sand and fine to medium gravel. Clay beds are present in some areas and the water in the Lloyd sand is under artesian pressure for a large part of its occurrence.

The clay member of the Raritan formation overlies the Lloyd sand; its thickness ranges from about 100 feet to 300 feet. Deposited above the Raritan clay member is the Magothy formation, estimated to have been laid down in the Mesozoic era during the Cretaceous age, about 180 million years ago. The Magothy formation is composed of irregular beds of gravel, sand, sandy clay, and clay and is believed to contain only fresh water. The Magothy is believed to vary in thickness from a few hundred feet along the north shore to about 1300 feet along the south shore.

Overlying the Magothy formation are the glacial deposits of the recent Pleistocene age. Most of these deposits are highly permeable sand and gravel.

Necessity for Wastewater Reclamation

The conservation of groundwater supplies to prevent salt water intrusion in the Long Island area is compounded of several factors. The acceleration of water table drop with increased rates of withdrawal is clearly illustrated in Figure 2, in which the levels of the water tables in Nassau and Suffolk Counties are compared. Discharge of wastewater to the ocean began in January, 1952 in Nassau County and the effect of withdrawal is clearly demonstrated. Suffolk County is as yet unsewered and substantially all of the used water is returned to the ground. The drop in the water table in the sewered area (Nassau County) began almost immediately following commencement of the discharge of wastewater effluents to the ocean. As may be seen from Figure 2, the variations in the water table level follows the cycles of drought and rainfall as is normal, but the trend was definitely downward in the sewered area (falling practically to sea level) while it remained balanced (at about 10 to 12 feet above sea level) in the unsewered area.

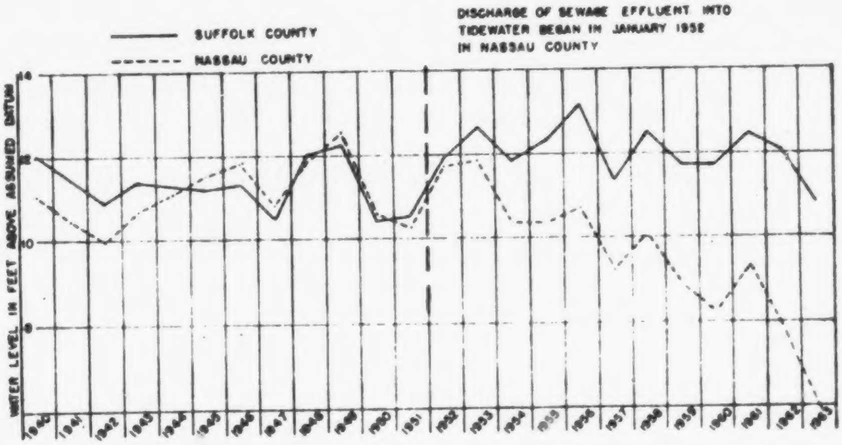


FIGURE 2.—Average yearly groundwater level on Long Island. (Ft × 0.305 = m.)

It is important to maintain a high water table in the case of Long Island, surrounded by salt water and with a piezometric pressure in the Magothy (freshwater) formation only a few feet above sea level.

Three alternatives for wastewater disposal are available:

(1) Disposal by wasting the (treated) effluent to the ocean.

(2) Reclamation of effluents via artificial recharge to groundwater for beneficial purposes.

(3) Complete renovation for direct public reuse.

Comparative cost estimates for supplementing water supply by renovation for Long Island, comparing artificial recharge of wastewater effluents with importation of water and desalination of seawater are shown in Figure 3.

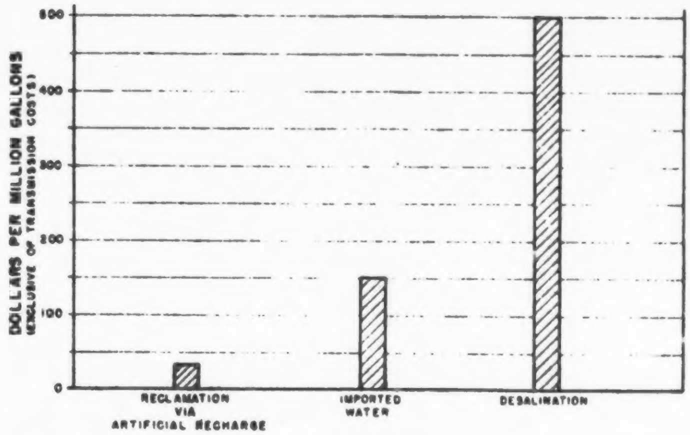


FIGURE 3—Comparative costs of various methods of supplying 50 mgd (189,000 cu m/day). ($/mil gal ÷ 3.78×10^{-4} = $/cu m.)

These estimates are for the cost of finished water and do not include transmission pipelines or pumping stations, required in all three cases. In addition to the immediate economics, the continued use of groundwater has major advantages:

(1) The groundwater basin provides a natural reservoir large enough to hold several years of water supply and thus provides automatic compensation during wet and dry periods. This is not possible for imported supplies without a heavy investment.

(2) Evaporation losses are little or non-existant in the groundwater reservoir.

(3) Groundwater development may be carried out in stages according to available capital and population needs. Imported water development may not permit this flexibility without heavy investment.

(4) Groundwater is protected from radioactive fallout.

(5) Wastewater reclamation by artificial groundwater recharge saves the costs of trunk and outfall sewers to the ocean.

Methods of Wastewater Renovation

It is generally known that each use of water adds about 300 mg/l of total dissolved solids. Therefore, several repeated uses of the water will multiply rapidly the TDS concentration beyond acceptable limits. Therefore, during the renovation proceedings removal of the suspended solid by filtration down to 5 mg/l or less is necessary before shallow well injection or diffusion wells can be employed.

This method taking advantage of artificial recharge to replenish groundwater is practiced in California. In this method, underground travel and underground storage are utilized to accomplish final purification and the dilution available from natural recharge is used to overcome the effects of the buildup of TDS due to repeated reuse. Tertiary treatment includes only that necessary to permit economical injection of the water via recharge basins or injection wells. Additional purification is available in the ground by means of long-distance filtration through aquifer pores, anaerobic degradation of oxidized nitrogen and sulfur compounds, and by base-exchange action of soils. Where a short time lag exists (as in Dade County) between injection and reuse consideration should be given to some additional reclamation treatments before recharge. Even if carbon filtration is used, the economic picture remains virtually unchanged, i.e. groundwater recharge is cheaper than desalination of seawater or water importation.

Besides the Long Island experience, the practice elsewhere and operating experience is available with wastewater reclamation via artificial recharge at Whittier Narrows in California (1), where the feasibility of controlled artificial recharge has been demonstrated. This plant with 12 MGD capacity receives metropolitan community wastewater and produces an effluent which meets the U. S. Public Health Standards for drinking water.

From the standpoint of public health, the Whittier, Azusa, and Lodi, California operations (2)(3)(4) indicate that coliforms for all practical purposes are absent or very low in spreading basin effluents. Injection wells tests at Hyperion and Richmond, California (5)(6), have indicated that the survival of bacteria in underground water travel is limited to 10 to 800 feet.

Various investigators (7)(8)(9)(10)(11)(12) have indicated that combined wastewater treatment and disinfection can inactivate 99% of virus. Adequate concentration of disinfection and adequate contact time can inactivate virus completely. In addition, the work of Robeck et al..(13) proves that filtration through sand at rates in the range of underground water velocities removes practically all virus present. The long history of incidental recharge of cesspool effluent in Suffolk County on a large scale and the absence of epidemiologically significant viral infection data would seem to rule out the viral infection hazard. The recharge of water meeting drinking water standards is technically feasible and infinitely better than cesspool effluent.

Thus, wastewater effluent can be used to create shoreline barriers against salt water contamination of underground aquifers or can be used inland to supplement natural recharge and to maintain high groundwater levels which will prevent salt water intrusion.

Degree of Treatment Required Before Injection

The greatest increases during reuse of wastewater are due to TDS, chlorides, and bicarbonates. Therefore, it is of greatest importance to study the hydrogeology of the area. The degree of treatment given to wastewater before recharge affects the following:

(a) infiltration capacity of recharge basins,

(b) diffusion capacity of shallow wells,

(c) injection capacity of deep wells,

(d) degree of purification to be accomplished by underground travel, and

(e) required degree of effectiveness of dilution of artificially recharged water by natural recharge in relation to proximity of recharge and pumping facilities.

REFERENCES

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(2) Greenberg, A. E., and Gotaas, H. B., "Reclamation of Sewage Water", Amer. Jour. Pub. Health, 42, 401 (1952).

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(13) Robeck, G. G., Clarke, N. A., and Dostal, K. A., "Effectiveness of Water Treatment Processes on Virus Removal", Jour. Amer. Water Works Assn., 54, 1275 (1962).

Conclusions and Recommendations of the Federal-State Conferees
Dade County Enforcement Conference
October 22, 1970

The Conferees, representing the State of Florida and the Department of the Interior, unanimously agree on the following conclusions and recommendations:

1. Pollution of the navigable waters in and adjacent to Dade County, Florida, including the Atlantic Ocean, Biscayne Bay, and tributaries thereto which endangers health and welfare of persons is occurring and is subject to abatement under the Federal Water Pollution Control Act. This pollution is caused by discharges from numerous municipal, domestic, and industrial sources within Dade County.

2. Measures taken to abate this pollution have been inadequate.

3. The nature of delays being encountered in pollution abatement are: complexity of the problem; lack of effective planning, financing, and enforcement of pollution control laws; and lack of a commitment by the community to meet the pollution problem and abate it.

4. The Metropolitan Dade County Commission shall present a master plan for abatement of pollution from all sources in Dade County to the Conferees, through the State of Florida, by November 1, 1971. This plan is to be in a form acceptable for certification under applicable State and Federal laws and regulations. The plan is to contain sufficient detail so that all significant sources are identified. The plan is to include a time schedule for construction, with interim dates for arrangement of financing, preparation of preliminary plans and specifications, preparation of final plans and specifications, award of contracts and initiation of operation of remedial facilities.

5. The cessation of all waste discharges into the inland canal system of Dade County, Florida, shall be accomplished as rapidly as possible but not later than January 1, 1973.

6. A minimum of secondary treatment, providing at least 90% B.O.D. removal and year-round chlorination of the effluent, shall be provided for all waste as required by the State of Florida before discharge to the ocean as rapidly as possible but not later than January 1, 1974.

7. All new construction shall be connected to adequate sewage collection and treatment systems. The Conferees will meet not later than February 1, 1971, to consider the question of Dade County's building permit program with the view toward controlling additional pollution sources while the Dade County pollution abatement program is under design and construction. It is expected that the Dade County Metropolitan Commission will be prepared to present their action program to the Conferees at that time which will satisfactorily meet this problem, including a program for the elimination of septic tanks in all urban areas of Dade County.

8. Additional waste discharges to Lower Biscayne Bay, including the Biscayne National Monument, and its tributaries shall be prohibited. This same prohibition shall apply to discharges to canals in Dade County which drain to the Everglades National Park. Removal of existing municipal and industrial waste discharges from these waters shall be accomplished as rapidly as possible but not later than January 1, 1974.

9. All wastes from vessels used as domiciles or business establishments shall be discharged to onshore facilities. The Corps of Engineers is requested to report to the Conferees by February 1, 1971, on its program for removing abandoned hulks, debris, and other obstructions to navigation in the Miami River.

10. An inventory of all municipal and industrial waste sources within Dade County, Florida, shall be initiated immediately by the Federal Water Quality Administration in cooperation with the State of Florida and local officials, a report shall be made to the Conferees by April 1, 1971.

11. A technical committee comprised of the Federal Water Quality Administration, the State of Florida, and the Dade County Pollution Officer shall be established to develop, in cooperation with other Federal, State, and local agencies, a regional water quality management plan for the conservation and reuse of the waters of Dade County. This committee shall report to the Conferees as to its progress and future plans by November 1, 1971.

March 3, 1849

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
EVERGLADES NATIONAL PARK
AND
FORT JEFFERSON NATIONAL MONUMENT
P. O. BOX 279
HOMESTEAD, FLORIDA 33030

IN REPLY REFER TO.
L54

December 21, 1970

Mr. Murray Stein
Ass't Commissioner for Enforcement
and Standards Compliance
Environment Protection Agency
Water Quality
Washington D. C. 20242

Dear Mr. Stein:

After the recent Federal-State Enforcement Conference in Miami Mr. Nathaniel Reed, Chairman, Florida Department of Air and Water Pollution Control, requested information regarding areas of Dade County which discharge water into Everglades National Park or Biscayne National Monument. Herein is the material furnished Mr. Reed. We request that it be included in the minutes of the Enforcement Conference.

The enclosed map delineates the boundaries of those areas of Dade County that contribute to the canals discharging water to Everglades National Park and to lower Biscayne Bay, including Biscayne National Monument. The breakdown is as follows:

Area No. 1. South Dade County (West). Everglades National Park receives the discharge from several canals within the South Dade County project of the C&SFFCD. Portions of Canals 102, 103 and the L-31 system discharge into the Taylor Slough and/or the eastern panhandle area of the Park. Canals 109, 110 and 111 discharge into the eastern panhandle. For canal numbering see C&SFFC Project map dated February 1969.

Area No. 2. Southwest Dade County. Runoff from the 193 square mile Southwest Dade area now generally drains into the Shark Slough portion of the Park. When this authorized portion of the Flood Control Project is constructed, its canals and pumping stations will for the most part discharge into the Shark Slough but a small portion of the areas runoff will enter the canals of the South Dade project (L-31N and L-31W) and be released to Taylor Slough and eastern panhandle.

Area No. 3. Coral Gables Canal to Black Creek. This area includes the drainage of the Coral Gables, Snapper Creek and Cutler Drain Canals. Although discharge is not directly into Biscayne National Monument tidal movement in the Lower Bay area assures mixing with waters of the Monument.

Area No. 4. South Dade County (East) and Black Creek. Discharge from this area, the major part of the South Dade County project goes directly into Biscayne National Monument. Canals include Black Creek (C-1), C-102, C-103, and C-106.

Area No. 5. Turkey Point to U. S. Highway 1. Discharge from this area enters Card and Barnes Sound portions of the Bay. Inferior quality water will adversely affect the waters of the Monument and the Park.

All Dade County canals south of the Tamiami Trail discharge either into the Park or Monument or into their adjacent waters. Measures must be taken now and in the future to assure that water delivered to these areas via Dade County canals will not cause ecological damage or deterioration of the environment.

County canals north of Tamiami Trail have not been considered herein since they do not discharge into the Park or waters immediately adjacent to the Monument. Of course these canals should also be cleaned up. Eventually much of the area north of the Trail will be backpumped to Conservation Area No. 3. Backpumping the Tamiami Canal is a high priority item in the C&SFFCP construction schedule.

We were greatly encouraged by the statements of the Corps of Engineers and the Flood Control District at the Enforcement Conference. The strong stand by those agencies and the recommendations and timetable promulgated by the Federal-State conferees should soon provide the unpolluted water needed in all areas and by all residents of Dade County.

As you know we are working closely with the Corps and Flood Control District on the matter of water quality for the Park in connection with Senate Report 91-895. The Service is required by the Senate Report to prepare a report on water quality needs of the Park. We are now proceeding with this report. Subsequent to the Enforcement Conference we discussed the matter of water quality in Dade County canals with the County Manager.

We appreciate your assistance and ask that you let us know if you desire additional information.

Sincerely yours,

Joe Brown

Joe Brown
Superintendent

Enclosures under separate cover

cc:
Director, Southeast Region w/encs

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